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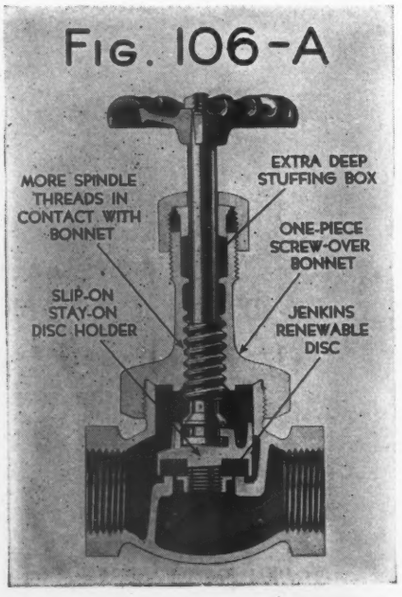

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Railway
Mechanical Engineer

Founded in 1832 as the American Rail-Road Journal

July - 1932

Mechanical Division, A. R. A., Holds Two-Day Meeting at Chicago

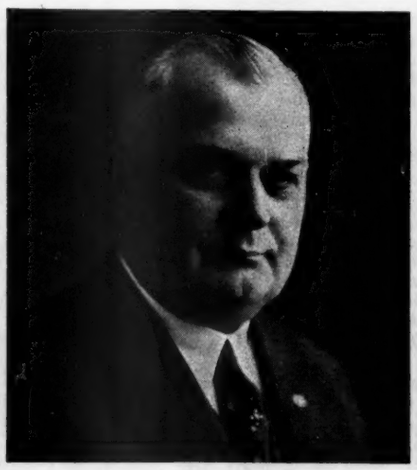
Sixteen technical reports are presented and discussed—Addresses by H. A. Wheeler, president of the Railway Business Association, M. J. Gormley and Commissioner McManamy feature business program—E. B. Hall elected chairman

THE Mechanical Division, American Railway Association, held its thirteenth annual meeting at the Congress Hotel, Chicago, June 23 and 24, 1932. A total of 16 technical reports were presented and discussed. The principal addresses at the opening session were delivered by H. A. Wheeler, president, Railway Business Association, and M. J. Gormley, executive vice-president, American Railway Association.

In his address as chairman of the Mechanical Division, Silas Zwight, general mechanical superintendent, Northern Pacific, commended the work of the various committees and pointed to past accomplishments of railroad-mechanical departments as a hopeful augury of what might be expected in the future. Following Mr. Zwight's address, a formal review of the activities of the division was presented in the report of the General Committee, in which the committee asked the approval of the members for the actions it has taken during the past year.

The rules were suspended by resolution, and the nominees for officers for the coming year presented by the Nominating Committee were elected by unanimous vote. They are as follows: E. B. Hall, general superintendent of motive power, C. & N. W., chairman; and O. A. Garber, chief mechanical officer, Mo. Pac., vice-chairman. Six members were elected to the General

Silas Zwight
Chairman



E. B. Hall
Chairman Elect

V. R. Hawthorne
Secretary

Committee to succeed those whose terms expired this year. These are C. E. Chambers, superintendent of motive power and equipment, C. R. R. of N. J.; F. R. Mays, general superintendent of motive power, I. C.; John Purcell, assistant to vice-president, A. T. & S. F.; R. L. Kleine, assistant chief of motive power, Pennsylvania; J. W. Highleyman, general superintendent of motive power and machinery, U. P. System; and R. G. Henley, superintendent of motive power, N. & W. Silas Zwight, general mechanical superintendent, N. P., was elected to fill the vacancy caused by Mr. Garber's election as vice-chairman.

In addition to the addresses and reports, which are summarized or abstracted below, the Joint Committee on Utilization of Locomotives and Conservation of Fuel presented a statistical review and analysis of locomotive and train operation in which the results obtained in 1930 and 1931 are compared with those obtained in each preceding year back to 1920. The committee reported that no field surveys have been made by the subcommittee during 1931.

Address by Mr. Wheeler

In addressing the Mechanical Division Thursday morning, Harry Wheeler, president of the Railway Business Association, stated that the railroads are facing problems more general and more difficult of solution than any heretofore confronting them, but that an opportunity now exists to take advantage of an increasingly favorable public sentiment "to secure relief from too rigid regulation, to secure the repeal of certain burdensome legislation, and to bring about either the better control of competitive agencies or such freedom of action to the roads as will enable them to compete on terms of equality."

Regarding the great opportunity for constructive work in influencing major railroad legislation, Mr. Wheeler said: "In this, the executives of the railroads hold the key to the situation because of the necessity that they agree upon a program in which pride of assumed property rights and prerogative shall be subordinated to a broad and generous recognition of present-day public interest.

"Behind such an agreement," he said, "can be marshalled as never before the forces that will make effective, sound and just provisions of law and regulation to usher in a new day of sympathetic understanding and co-operation."

Three facts were advanced by Mr. Wheeler as the most important reasons why railroad earnings must be increased: "(a) Railroad securities must be stabilized before other security issues feel a permanent favorable influence; (b) failing to secure such stabilization savings banks and insurance companies will become increasingly embarrassed in their efforts to maintain their reserves, which means their solvency; (c) in the absence of improved earnings, continuing and larger loans are inevitable from government sources to meet fixed charges, and such continuation will give the government a stake in the roads sufficient actually to imperil private ownership."

Mr. Wheeler called attention to the fact that the railroads of the country are the largest single buying group and that their purchase of self-liquidating goods is profitable to them and enormously important to the country. Regarding the installation of modern equipment, Mr. Wheeler said: "I do not need to use any illustration to this group who know so well what equipment of the most modern type does to the direct costs of operation and to reducing costs of maintenance and repairs. Such purchases would at once increase revenue tonnage, increase employment, increase consuming power through wages distributed, expand general business operation, and through this expansion further increase tonnage and employment not only to the point of interrupting the contraction from which we have suffered steadily since 1929, but serving to break the stranglehold of depression and produce an expansion movement that would restore a measure of normality.

"You may well ask me if I think it is a matter of *justice* to appeal to the railroads of the country in this critical period through which they are passing to risk the incurring of further indebtedness and the assumption of further burdens in order to turn the existing devastating tide, and my answer is emphatically *no*.

"*Justice* alone could not exact further sacrifice from the roads. It is a matter of recent history that in the generous co-operation given to the President in 1930, when he pledged the important industries to proceed with their normal operations in spite of the thickly-gathering depression clouds, purchases were made and employment continued by the roads beyond immediate requirements. To urge the roads again to step into the breach may seem unreasonable, but since only the earnings from increased operating efficiency and from increased tonnage will provide required operating earnings and lacking earnings defaults are inevitable, it would seem that self-preservation would suggest their entering the market for the purchase of self-liquidating equipment and supplies, particularly if payments can be arranged so that no immediate use of any of their present cash resources will be required."

Mr. Wheeler said that we have a right to be dismayed at the continuing process of curtailing purchases, restricting expenditures, liquidating debts and denying credit. He did not object to these processes when adjustments are necessary and wise at the beginning of a period of depression, but maintained that this negative program narrows the circle of operation; is a doctrine of defeatism, and, in the long run, will ruin any business of any country.

In advocating a more constructive policy of adjustment, Mr. Wheeler said: "While it may seem like lifting ourselves by our own bootstraps, the decision to go forward of that largest single interest in the country, with the largest buying power and the largest distributive ability, may be the one factor that would turn the tide and save itself while saving the country from further indefinite suffering and loss. I hope you will believe me that when I put forward this suggestion I do not hold that manufacturers in broadly diversified lines are without responsibility to aid in this program."

Mr. Wheeler concluded his address with a concise restatement of a few of the corrective influences evident at the present time which were also mentioned in his address before the Purchases and Stores Division, and published in detail elsewhere in this issue. He maintained that if these favorable influences are accepted as reasons for confidence and faith by the people in increasing their purchases and in preparation for further business, railroad traffic and earnings will reflect the upward trend and the depression will have entered a new and more hopeful phase.

Address by Mr. Gormley

"Many abuses can be pointed to today as a result of the increase in private ownership of equipment in the past few years. Railroads are being required to perform extra switching and incur unnecessary empty mileage in delivering such cars to shippers for loading where there is an available supply of railroad-owned or railroad-controlled equipment."

This statement, from a part of M. J. Gormley's remarks at the 1931 annual meeting which he quoted in his address during the opening session of this year's meeting, he said, represented a situation which had not been eliminated or corrected during the past year, but had become worse.

"In the light of conditions now existing," he said, "I believe that it will not be long before the railroads will adopt a tariff regulation which will correct the troubles they are now experiencing in connection with privately-owned refrigerator cars and restore to the railroads their right to arrange for their car supply in any manner they desire, so long as adequate and suitable cars are available for movement of the traffic offered. Such a rule is now being studied by all railroads, and we have no reason to believe that it will not be adopted in the near future."

In reviewing the situation in which the railroads find themselves today, Mr. Gormley pointed out that there are almost 600,000 less employes on the railroads now than in 1929, and that all possible curtailments of expenditures are being made, but that no impairment of service has resulted. He said that while 894,264 new freight cars and 15,431 locomotives had been placed in service since 1923, the retirement of old equipment had reduced the railroad ownership of equipment by 176,302 cars and 10,905 locomotives. He attributed the excellent service to the railroads since 1923 to the investment made in equipment and other facilities and to shipper co-operation. "Of equal importance," he said, "this service has been rendered, due to efficiencies and economies effected, at reduced cost. If there had been no reduction in the unit cost of railway operation between 1923 and 1929, net railway operating income in 1929 (which as you know was the last year of heavy traffic) would have been less than it was to the extent of $442,853,000.

"Such a tremendous saving argues irrefutably the wisdom of the expenditures which brought it about. Unfortunately, however, instead of reaping the benefit of this accomplishment, the railroads found that it was barely sufficient to offset the effects of the general 10-per cent reduction in rates ordered by the Interstate Commerce Commission in 1922. In 1929, net railway operating income would have been greater than it was, had the 10-per cent reduction in rates not been made in 1922, by $454,793,000."

Referring to the criticisms of the railroads for a lack of a centralized research institution, Mr. Gormley cited a number of research projects which the railroads are conducting, through the agency of the various divisions of the American Railway Association, and concluded as follows: "While we feel that an undertaking of centralized research, as the term is understood in many industries, on a large scale would promise no results that cannot be attained under present facilities for research, it is possible that now, or at some future date, it may be necessary to expand in some way the work that is now being done. It is always a good thing to take an inventory of any kind, and to consider all possibilities of improvement in any direction. Under present conditions, therefore, it might be well for the Mechanical Division to give its consideration to the following questions:

"Are there possibilities for greater accomplishment in the direction of improved service and economy of operation through centralized research, under the direction of the Mechanical Division, beyond what has been undertaken?

"If so, along what lines should such work be pursued?

"a—In the development of standard equipment, cars and locomotives with a view to adoption of the best possible practices, with economy in original cost and maintenance, to a greater extent than has heretofore been undertaken.

"b—In testing of new devices offered by manufacturers for improvement in locomotives and cars before adoption by any line, in order to insure experimental work being undertaken by an independent body and with a lower cost than is now incurred under present methods; with a further view of preventing expenditures for such devices until their merit is thoroughly proved by independent research.

"c—Determination whether joint inspection service of materials could be adopted with lessened expenses and without a decrease in the efficiency of the present method.

"d—Investigation of the manner of billing for car repairs, including feasibility of handling through a clearing house or otherwise, thereby eliminating accounting expense.

"e—Should there be established a clearing house to which individual railroads would report as to new methods or new devices adopted, in order that proper publicity could be given and in order that the information might be disseminated promptly to all lines for their mutual benefit.

"f—Such other matters as the Division, itself, may determine as advisable in the interest of the adoption of the best possible practice in all matters relating to equipment and mechanical devices of every sort."

Address by Frank McManamy

On Friday morning Frank McManamy, member of the Interstate Commerce Commission, delivered a short address expressing the appreciation of the Interstate Commerce Commission for the spirit of co-operation and helpfulness displayed by the Mechanical Division and its members in their relations with the commission. Mr. McManamy said that with the exception of about six meetings he had been regularly attending the conventions of the Mechanical Division and its predecessor, the American Railway Master Mechanics' Association, since 1899, when he was a locomotive fireman. Mr. McManamy cited the record of persons killed and injured in 1931 as compared with 1907 to show the marked reduction in casualties which has taken place during that time and pointed out the impressiveness of this record when compared with the safety of other forms of transportation since developed. He said that railway trains were about the safest place in the country and were also becoming about the most comfortable with the advent of air conditioning, and he expressed his admiration for the initiative displayed in developing this improvement which, combined with safety of railway transportation, he predicted would lead to a return of public favor for railway-passenger travel. Mr. McManamy dwelt on the legislative character of much of the work of the mechanical division and on the mutual interdependence of the division and the Interstate Commerce Commission in carrying out the provisions of the laws pertaining to railway service.

Report on Safety Appliances

The report of the Committee on Safety Appliances sets forth the action taken on the report of the power-brake investigation and the progress being made in the investigation of automatic train-line connectors, on which a separate report was presented by Harley A. Johnson, director of research. It also reports the favorable result of the letter ballot recently taken on three propositions: The recommendations covering the application of additional grab irons on each side of house, hopper and high-side gondola cars at the end opposite the side ladder; rules to standardize the operation of uncoupling levers, and the standard locations for retaining valves on all types of cars.

The Power Brake Investigation

The committee quotes as follows from a report by Director of Research Johnson:

"The investigation of power brakes and appliances for operating power brake systems being conducted by the American Railway Association under order No. 13528 of the Interstate Commerce Commission has been continued during the past year. At the time of the 1931 convention the road tests were completed and the records of the tests were being compiled, analyzed and a report prepared. Reference is here made to the reports of the Director of Research at the annual meetings of the Mechanical Division for the years 1925 to 1931, inclusive, which present the progress up to June, 1931.

"The report of the investigation, which is now completed, has been prepared in two forms, one known as the abstract of the report and the other as a copy of the detail report. All of the men employed by Purdue University in connection with the power brake investigation were laid off prior to or at the completion of this report. The abstract of the report was submitted to the General Committee of the Mechanical Division and, after receiving the approval of this committee, 500 copies were printed for distribution to the members of the association.

"Four copies of the detail report were prepared at Purdue University. The Secretary of the Mechanical Division, at the direction of the General Committee, forwarded the original copy of the detail report to W. P. Borland, director of Bureau of Safety, Interstate Commerce Commission, on April 1, 1932. The second copy of the detail report is on file in the office of the secretary of the Mechanical Division in Chicago. It is planned to file the third and fourth copies of the detail report in offices of the association in New York City and Washington, D. C."

Automatic Train-Line Connectors

The progress being made in the automatic train-line connector investigation was reviewed in a separate report presented by H. A. Johnson, director of research, who is in charge of the investigation under the Joint Committee on Automatic Train-Line Connectors of the American Railway Association. Direct supervision is in the hands of a sub-committee headed by C. E. Chambers, chairman of the Committee on Safety Appliances, and of which R. L. Kleine, chairman of the Committee on Couplers and Draft Gears, and G. H. Wood, chairman of the Committee on Brakes and Brake Equipment, are members.

Types of Connectors Selected for Laboratory Test

Type of Connector	Method of support	Method of gathering	Type of ports	Date of starting tests—Freight types
Robinson—Wing*	Coupler	Wing type	Butt face	Sept. 29, 1930
Robinson—Pin and funnel	Coupler	Pin-and-funnel	Butt face	Dec. 20, 1930
American	Coupler	Pin-and-funnel	45 deg. (approx.)	Feb. 13, 1931
Roberts	Coupler	Wing type	Butt face	July 16, 1931
Workman—Robinson	Coupler	Wing type	Butt face	.....
National	Coupler	Pin-and-funnel	67 deg. (approx.)	April 23, 1931
Cobb	Carbody	Modified pin and funnel	Side port	.....
Johnson	Carbody with guide from coupler	Modified pin and funnel	60 deg. (approx.)	April 4, 1932
McTaggart	Coupler	Combination of wing and pin-and-funnel	Side port	.....

* Tests of the passenger type were started October 20, 1931, and a test of a passenger connector on one car and a freight on the other was started on February 12, 1932.

The report states that 46 companies or individuals have submitted plans or specifications of their devices. Nine different devices have been selected as representative of the various types, and six freight and six passenger connections of each have been ordered for laboratory tests. The table shows the names of these devices, classified as to method of support, method of gathering and type of ports. For freight service, all of these, except the Workman-Robinson, Cobb and McTaggert, have been delivered. For passenger service, the Robinson wing type is the only passenger connector which has been delivered.

Several devices have been proposed which combine the car coupler and the train-line connector in a single device, but the director reports it has been advisable to delay the consideration of devices of this type until after those which do not require a change of the present car couplers have been investigated.

Representatives of the Bureau of Safety, the train-service brotherhoods and the manufacturers of the devices being tested have been present at various times during the conduct of the tests.

The report was signed by C. E. Chambers (chairman), superintendent motive power and equipment, Central of New Jersey; C. J. Bodemer, superintendent machinery, Louisville & Nashville; F. W. Hankins, chief motive power, Penna.; F. H. Hardin, assistant to president, New York Central; J. Purcell, assistant to vice-president, Atchison, Topeka & Santa Fe, and J. J. Tatum, general superintendent car department, Baltimore & Ohio.

Action.—The report on Safety Appliances and the report of the director of research on the Automatic Train Line Connector investigation were accepted.

Report on Locomotive And Car Lighting

The rapidly changing horizon of the field for electrical energy on our trains makes it practically impossible to submit exact recommendations at this time. However, as a record of progress, your committee would submit the following report.

Power for Air Conditioning

Depending upon the type and construction of the cars to be equipped for air conditioning and the territory in which the car will operate, it has been fairly well established that mechanical equipment of from two to six tons of ice refrigerating capacity is required properly to cool a passenger train car during the hottest periods of the summer, the lower figure being suitable for well insulated cars in the cooler zones and the higher for steel cars in the hotter zones. The power required to produce this capacity will run not less than 1½ hp. per ton, including auxiliary equipment. The production of this amount of power on a car, in addition to the present lighting requirements, is quite a problem.

Air-conditioning equipment now installed, or under construction, can, for our purposes, be classified as follows:

1—Systems using ice as the refrigerant which requires less than 1 kw. of electric power per car for pumps, blowers, fans, etc. This is the simplest system as far as power requirement is concerned. The 1 kw. or less needed can, in many cases, be taken from the existing car-lighting equipment.

2—Compressor systems of mechanical refrigeration with electric power drive obtaining their power by one of the following methods: (a) Additional axle generator of suitable size to furnish the required power, and in addition charge a large capacity storage battery which furnishes power when the car is standing; (b) axle generator of suitable size for use while car is in motion and requiring connection to outside power lines when standing at terminals and when precooling; (c) head-end system.

With mechanical systems having the compressor or compressors electrically driven a much larger generator is frequently needed. Most of the installations now being made will use either a 7½ or 10 kw. generator in addition to the car-lighting generator. One generator of 15 kw. capacity will be offered in the near future. It is hardly practicable to drive such generators from the axle with the usual flat-belt arrangement, for the power to be transmitted is not only much greater, but the speed ratio cannot be obtained with reasonable size pulleys.

Storage batteries to furnish power when the car is standing are now being offered with capacity up to 1,000 amp.hr. at the eight-hour rate, which will go in a standard battery box. The same battery can also be used for lighting.

Mechanical systems not using a battery for stand-by service require a motor which must be "plugged in" to outside power circuits. The amount of power required, if several cars on a train are cooled, cannot be furnished by existing battery-charging installations. The distribution of such amounts of power at 32 volts is not economical because of heavy losses and the large size of copper required. Where new installations are to be made for this purpose, the logical method, and that recommended by the power companies is to use 220-volt, three phase distribution.

3—Compressor systems of mechanical refrigeration with the compressor driven from the car axle by a direct drive through suitable speed-control equipment, while the car is in motion, and driven by a separate electric motor connected to outside power lines when the car is standing at terminals and when being precooled. Power for auxiliary equipment is taken from the car-lighting system.

4—Systems using steam for power for refrigeration apparatus and requiring 2½ hp. of electrical energy from the car-lighting system for the auxiliary equipment.

The system using steam as the main source of power is reported as requiring per car per hour approximately 170 lb. of steam at 55 lb. pressure. Tests made indicate that this amount of steam can be obtained from the train-line in summer for approximately a 15-car train. Increasing the train-line from 2 in. to 2½ in., with the use of 2-in. metal connectors, would be required to permit the handling of more cars. As offered, this system includes a generator and battery of proper size to take care of the additional electrical power required.

Drives for Axle Generators on Passenger-Train Equipment

Diehl drives have now been in service for over three years and the service obtained has been quite satisfactory. A single railroad having 60 cars equipped with the Diehl type of drive, 56 of which have been in service over one year, 17 over two years and 6 over three years, reports that since November, 1930, five equipments have made a total mileage of 785,850. During this period no defect was reported which necessitated making any repairs between terminals. One of these equipments was operating on a train the speed of which averages over 60 miles an hour. The maintenance cost of these equipments averaged $57.17 per car per year, $20 of which was on account of grease. Tests recently completed demonstrate that a different quality of grease will operate satisfactorily and should reduce this item very materially.

A Stone drive No. 2 is operating on one Canadian road and the results obtained are reported as very satisfactory. An application made in November, 1930, has been in continuous operation on main-line trains. On February 13, 1932, the car was sent to the shop for general repairs and on removing the equipment it was found to be in very good condition, there being no signs of wear on worm or driving gear, housing, clutch, etc. The total mileage obtained to date is 94,926 miles. No repairs have been made to this equipment to date, the only charge being one for oil amounting to approximately 20 cents per month. It is, however, understood that the manufacturers are prepared to provide a larger oil well, which considerably increases the length of oiling periods over the present 350 miles.

Reports of the performance of the *Foote drive* for generators of 2 to 5 kw. capacity, and in service approximately four years, are satisfactory as to costs and reliability.

The Safety Car Heating & Lighting Company, in collaboration with the *Morse Chain Company*, is developing a V-chain drive for axle generators, which consists essentially of a special form of silent chain with a shroud placed around the links so as to give the chain a V-section. This chain runs in sheaves having specially faced V-grooves. In this way all the advantages of the silent type of steel chain are retained and at the same time it is not necessary to use sprockets for it to run on.

Each chain when made up is supplied with several coupling links so that it is possible to separate the chain as well as possible to adjust the length of the chain to meet service conditions.

Texrope drives, reported as applied to 15 Pullman cars, consist of a three-groove split-axle pulley, a three-groove generator pulley and three ⅞-in. by ⅝-in. V-belts of a suitable length for the pulley centers. The belts are endless and it is, therefore, necessary to put them over the wheels, around the brake beam and through a slot arranged in the truck end sill. This slot is covered with an angle-iron splice plate bolted to the end sill.

The drive will transmit 12 hp. at 30 m.p.h. without overloading the belts. There is practically no slip. While there is more expense to renewing belts than with the usual flat belt, it is probable that this expense would be justified in view of the life of the V-belts and freedom from slippage. The first drive

has run 180,000 miles without repairs. These drives have gone through two winters, but not enough bad weather was encountered to determine whether the drive will always work under the severest winter condition.

Dayton-Roderwald Drive.—The Roderwald belt, which has been used quite extensively in Germany for axle generator drives, is being developed in this country by the Dayton-Rubber Company. The belt, which is of the V type, 2 in. wide and about ⅞ in. thick, is made of folded bias fabric. This gives it sufficient strength to hold a fastener, making it unnecessary for the belt to be endless.

This belt has been used with several types of drive mechanisms for car-lighting work. One of these, which has been applied to a number of cars, had the generator mounted semi-rigidly on the end sill of the truck. The generator pulley is mounted on a tension device also mounted on the end sill, and is connected to the generator shaft through a short shaft containing two universal joints. This arrangement is claimed to function during severe winter weather when the usual flat belt slips badly.

Reports received indicate that mileages of 75,000 or better are being obtained with this belt. Extensive research is still going on anticipating improvements in this performance.

A special direct drive designed by the *Pullman Car & Manufacturing Corporation* for developing power necessary to operate air-conditioning equipment consists of a split cast-steel hub or quill mounted on rubber bushings applied to the standard railway car axle. This split hub carries a hardened-steel spur gear at each end and spacer rings adjoining each gear to keep the pitch circles tangent. A tension spring keeps these spacer rings in contact. The driven member is attached to the truck end sill and includes a housing carrying a pair of bevel gears operating in oil. One of these bevel gears is mounted on a shaft which runs parallel to the axle on each end of which is carried a spur gear which mates with the gears on the hub of the drive member. The bevel gear housing is mounted in such a manner that it will follow the movement of the axle in all planes while in operation.

Effect on Train Tonnage of Added Car Resistance

In connection with the adding of power developing equipment, both electrical and mechanical, through the medium of the car axle, freight or passenger, and the apparent thought that such added load can be almost indefinitely pyramided, attention must be brought to the fact that there will be limits beyond which one cannot go without anticipating either larger locomotives or a reduction in the tonnage ratings.

Any theoretical estimate as to what these added individual car loads amount to should be closely checked by actual service. With that thought, the committee suggests that railroads should endeavor to obtain in the various assignments of their dynamometer cars some comparative figures on train and car resistance, with and without axle generators installed, and make such figures available for the study of the Mechanical Division. With a reasonable amount of such data, the trend as to the net added train or car load could be indicated.

Other Subjects—Telephone and Radio Facilities

[The Committee is continuing a review of the installations of plugs and receptacles for electric marker lights and is considering the possibility of the use for this purpose of the plug and receptacle being developed by the Telephone and Telegraph Section for plugging in telephone lines to passenger-train cars at stations. A tentative form for battery guarantee has been developed by the committee which will soon be reviewed by the battery manufacturers. A study of the advisable location and details of application of radio antennae is being made in co-operation with the Electrical Section for the purpose of protecting against accidental contact with high tension trolley wires. The committee suggests that the revisions which have already been prepared for Section H of the Manual be deferred in the interests of economy, as the present recommended practices do not appear to be in serious conflict with the actual practice.—Editor.]

The report was signed by W. E. Dunham (chairman), superintendent car department, Chicago & North Western; E. P. Chase, assistant engineer, Pennsylvania; H. A. Currie, electrical engineer, New York Central; E. Wanamaker, electrical engineer, Chicago, Rock Island & Pacific; A. E. Voight, engineer car lighting, Atchison, Topeka & Santa Fe; F. O. Marshall, electrical engineer, Pullman Company, and P. J. Callahan, supervisor car and locomotive electric lighting, Boston & Maine.

Action.—The report of the Committee on Locomotive and Car Lighting was accepted.

Automotive Rolling Stock

The work of the Committee on Automotive Rolling Stock for the year 1931-1932 comprised the revision of the list of the rail-motor cars put in service since 1923, bringing it up to date, arranging it more conveniently, and making a special study relating to streamlining of railroad equipment with particular reference to rail-motor cars.

Questionnaires were sent out relating to rail-motor cars put in service since the last report of the committee. Replies were received from 142 railroads in Canada, Mexico and the United States. Of this number but 16 had any changes or additions to their rail-motor-car equipment, two were making their initial report and 124 had nothing to report. The total number of cars placed in service since 1923 is now 769. During the same period the average horsepower rating of the cars placed in service rose from 97.5 in 1923 to 508 in 1932. Unusually complete and comprehensive data concerning the cars in service are included as an appendix to the report. These data include salient points regarding both car body and motive power and are arranged under the following headings: Number of cars, date (year) in service; type of power plant (whether source of energy is steam engine and boiler, oil or gasoline engine, or storage battery, and whether transmission is electrical, mechanical or hydraulic); total horsepower of power plant and whether latter is composed of one or more units; overall length of car; length of engine compartment; length of baggage (or express) compartment; length of mail (R.P.O.) compartment; length of passenger compartment (total length regardless of division into smoking, passenger sections, etc.); seating capacity; and weight.

Streamlining of Cars

Concerning the streamlining of railroad equipment, with particular reference to rail-motor cars, the report states: "The railroads today can claim safety in transportation as one of their cardinal virtues. Beyond this, however, probably the two next most important qualities demanded by present-day transportation are speed and economy. Streamlining affects these two items vitally, and hence should be considered for railroad equipment where physical or other limitations do not prevent."

Information concerning a quantitative determination of the effects of streamlining are included in the report. Credit for this section of the report is given to O. G. Tietjens and K. C. Ripley, who made a study of these effects and presented their findings to the American Society of Mechanical Engineers. An abstract of their paper was published in the February, 1932, issue of the *Railway Mechanical Engineer*, page 61. The report also includes a description of the streamlined cars used by the Philadelphia & Western of which the following is an abstract:

High-Speed Streamlined Interurban Cars

It is apparent that there is a wide difference between perfectly streamlined trains or cars and existing trains or cars. The former would in all probability be impossible of construction without great divergence from present-day standards. It is, however, quite feasible to compromise and apply streamlining to new equipment without too great sacrifice either of existing standard or of the advantages of full streamlining. This, in effect, has been actually accomplished in the case of 10 new electric interurban cars recently placed in service on the Philadelphia & Western.

The design of these cars was predicated on extensive wind-tunnel tests. This is undoubtedly the first example in this country of the direct application of wind-tunnel test results to the design of railroad equipment.

The following table gives the percentages of power saving at various speeds from 20 m.p.h. to 90 m.p.h. of a streamlined model compared with a model of an existing interurban car operated by the same electric line.

M.p.h.	Power reduction, per cent
20	17.25
30	26.80
40	33.1
50	37.2
60	39.9
70	41.8
80	43.0
90	44.0

Due to double-end train operation and other practical considerations, the cars as finally constructed departed somewhat from the streamlined model. They were, however, streamlined to the greatest extent possible consistent with physical and operating conditions.

The principal dimensions and weights of the cars are as follows:

Dimensions	
Overall length	55 ft. 2 in.
Length over body corner posts	37 ft. 8 in.
Length of vestibules over dashes	8 ft. 3 in.
Truck centers	34 ft. 0 in.
Extreme width	9 ft. 2⅛ in.
Height from rail over roof	10 ft. 6½ in.
Height from rail to top of car floor	3 ft. 3 in.
Height from floor to ceiling	7 ft. ¾ in.
Height of door opening	6 ft. 2 in.
Width of door opening	2 ft. 10 in.
Width of seats	40 in.
Width of aisle	24 in.
Weights:	
Body less electrical and air-brake equipment	21,620 lb.
Electrical and air-brake equipment	4,000 lb.
Trucks	16,390 lb.
Motors and gears	10,380 lb.
Total	52,400 lb.
No. of motors per car	4
Total motor horsepower per car	400
Running time for express trains, Philadelphia, Pa., to Norristown, Pa., 14 miles	16 min.

The center of gravity of the cars was lowered for easy riding at high speeds and the overall height of the cars was kept as low as possible in the interests of reduction of end area and consequent decrease in air resistance. Aluminum was used extensively to reduce weight.

Application of Streamlining to Rail-Motor Cars

The application of streamlining to rail-motor cars could be undertaken with two objects in mind; viz., to reduce air resistance at the higher speeds for the sake of increased economy, or to create a special high-speed type of self-propelled rail-motor car, corresponding to the P. & W. interurban car.

Reducing air resistance at the higher speeds would make possible the use of smaller power plants for the same speeds with reduction in weight and operating expense, or would allow of greater utilization of the larger power plants to haul greater loads or operate at higher speeds or both. Either alternative should be attractive, provided there is a sufficient amount of high-speed operation to make the economy obtained worth the expense.

It would seem that for the second objective, i.e., the creation of a special high-speed type of rail-motor car, there should be some attractive fields of application where traffic could be stimulated and built up to profitable amounts. Certainly, really high-speed operation of comfortable, clean cars, free from the annoyance and discomfort of smoke and cinders, should make a favorable appeal for patronage and should offer strong competition to both buses and airplanes.

Streamlining gives promise of making practicable the development of such a type of car by eliminating the need for the excessively large power plants with their attendant high operating expense that would otherwise be required for high-speed operation. The cost of high-speed operation, from the standpoint of rolling stock, may quite possibly be brought within reasonable limits by this means. In view of the present-day demand for speed, any agency tending to do this is worthy of consideration.

Conclusion

Regarding activities of the Committee on Automotive Rolling Stock for next year, it is proposed to keep the tabulation on rail-motor cars put into service since 1923 up-to-date.

It is the recommendation of the committee that further study be made of streamlining of rail-motor cars with the ultimate aim of wind-tunnel or service tests. Concerning the desirability of this, the committee requests the opinion of the members.

To make the work of the committee as helpful as possible to the various railroads of the A.R.A., suggestions as to future activities would be greatly appreciated.

The report was signed by P. H. Hatch (chairman), assistant engineer, New York, New Haven & Hartford; H. F. Finnemore, assistant electrical engineer, Canadian National; B. N. Lewis, mechanical superintendent, Minneapolis, St. Paul & Sault Ste. Marie; F. K. Fildes, assistant engineer, Pennsylvania; J. R. Jackson, engineer tests, Missouri Pacific, and E. Wanamaker, electrical engineer, Chicago, Rock Island & Pacific.

Discussion.—Following the presentation of the report, the question was asked the committee what the railroads will get out of the application of streamlining. Chairman Hatch replied that the value of streamlining lies in high-speed service where speeds of 60 or more m.p.h. must be maintained. Such speeds, he intimated, may become necessary in some classes of service to meet competition of other transportation agencies.

Report on Electric Rolling Stock

Developments which have especially interested the Committee on Electric Rolling Stock include series-commutating type electric traction motors and transformer-tap voltage control of such motors. The report states that "during the past few years the design of single-phase, commutator-type traction motors has made remarkable progress and as a result, this type of motor stands out today as a vastly improved piece of machinery." As an example of the application of such motors, the several new locomotives as developed by the Pennsylvania are discussed.

Concerning voltage control, the report mentions the type of control developed by Brown-Boveri & Company, Ltd., Baden, Switzerland, and applied to locomotives rated at 6,400 hp. in which all of the low-tension switching equipment, with accompanying heavy conductors, are eliminated. The motors are permanently coupled to the low-tension side of the transformer and all speed control of the locomotive is effected by means of tap changer switches on the high tension winding of the transformer. These switches operate under oil, are attached to and made a part of the transformer.

Mention is also made of a commutatorless single-phase traction motor also developed by Brown-Boveri & Company.

The committee has studied the question of a standard system of nomenclature for electric locomotives and internal combustion engine locomotives having electric transmission. It was recommended that the American Railway Association adopt a system of nomenclature in which numbers are used to designate idle axles, letters to designate driving axles, a plus sign to show an articulated joint, and a minus sign to indicate swivel type trucks not articulated. Under this system the designation 1-D-1 indicates a locomotive with a single-axle guiding truck at each end and four driving axles in a rigid wheel base in the center.

The report was signed by R. G. Henley (chairman) superintendent motive power, Norfolk & Western; J. H. Davis, chief engineer electric traction, Baltimore & Ohio; J. V. B. Duer, electrical engineer, Penna.; J. W. Sasser, superintendent motive power, Virginian; R. Beeuwkes, electrical engineer, C. M., St. P. & P.; L. C. Winship, electrical engineer, Boston & Maine; H. A. Currie, electrical engineer, New York Central, and A. L. Ralston, mechanical superintendent, N. Y., N. H. & H.

Action.—The report of the committee was accepted.

Report on Material Specifications

The Committee on Specifications for Materials presented a report covering revised specifications for four items, two exhibits being included to provide detailed specifications for heat-treated carbon-steel helical springs, and for certain high-pressure pipe fittings.

Helical Springs.—A complete revision of these specifications has been made to provide for heat-treated springs, in which the process of heat treatment is specified, rather than to attempt to secure such treatment by close tolerances on the finished springs, as is done in the present specifications. These specifications were prepared by the American Society for Testing Materials, and have been published and used for about two years with marked success, as reported by the spring manufacturers, and one member of this committee who has made some experiments. It is suggested that the revised specifications be adopted as recommended practice to replace the present standard specifications.

New Car Oil—This committee was requested by the Committee on Lubrication of Cars and Locomotives to consider the inclusion of requirements for an all-year-service car oil, and recommended that, in addition to the present requirements for summer and winter car oil, the following requirements shown in the table, for an all-year-service car oil be added to the table at the beginning of the specifications. These specifications, when approved by the Committee on lubrication, should be submitted to letter ballot.

All-Year Service Car Oil

Flash, min.	275 deg. F.
Saybolt viscosity at 210 deg. F., min.	50 sec.
Saybolt viscosity at 100 deg. F., max.	320 sec.
Maximum pour point test	Zero
Water, max.	0.10 per cent
Tarry matter, max.	0.05 per cent
Insoluble impurities (dirt), max.	0.10 per cent

Unions and Combination-Union Fittings for 300-Lb. Pressure—These specifications have been severely criticized because the material used in malleable-iron unions was required to meet the A. R. A. specifications for malleable-iron castings. These specifications do not permit the use of the cupola process and require a minimum tensile strength of 50,000 lb. per sq. in. and a minimum elongation of 15 per cent. A large proportion of the total tonnage of malleable-iron pipe unions and fittings is manufactured by the cupola process and, in order not to include these fittings, it was necessary not only to omit reference to the process of manufacture, but to omit the physical-test requirements of the present specifications, since cupola malleable iron will not meet these requirements. Therefore, these specifications have been revised, as shown in one of the exhibits. The title and scope have changed to include screwed fittings, which were standardized as to dimensions by the Committee on Locomotive Construction and approved by letter ballot in 1931. The process clause was revised so as to call for malleable iron or steel without reference to the process of manufacture.

Malleable-Iron Castings—In accordance with a request from the secretary of the Malleable Iron Research Institute to bring these specifications into line with present-day practice, Section II, Tension Tests, has been revised to increase the minimum tensile strength from 50,000 to 53,000 lb. per sq. in., and the elongation in 2 in. from 15 to 18 per cent. It is suggested that these recommendations be submitted to letter ballot of the association.

This report was signed by F. M. Waring (chairman), engineer of tests, Pennsylvania; C. P. Van Gundy, engineer of tests, Baltimore & Ohio; Frank Zeleny, engineer of tests, Chicago, Burlington & Quincy; H. G. Burnham, engineer of tests, Northern Pacific; J. C. Ramage, engineer of tests, Southern; J. H. Gibboney, chief chemist, Norfolk & Western; F. T. Quinlan, asst. engineer of tests, New York, New Haven & Hartford; T. D. Sedwick, engineer of tests, Chicago, Rock Island & Pacific; H. W. Faus, engineer of tests, New York Central and E. E. Chapman, engineer of tests, Atchison, Topeka & Santa Fe.

Discussion.—Chairman Waring stated that following the publication of advance copies of the committee's report, a conference was held with the Committee on Lubrication, and it was decided that, in view of the fact that a satisfactory all-year car oil is still in the process of development, it is too early to justify issuing detailed specifications; that the paragraph giving these specifications in the committee's report should be eliminated and progress in developing an all-year car oil reported.

Action.—With this modification, the report of the committee was accepted and the recommendations submitted to letter ballot.

Report of Committee on Locomotive Construction

The report of the Committee on Locomotive Construction is divided into five parts, including the design of three fundamental locomotive parts; standardization of high-pressure valves; advantages and disadvantages of high boiler pressure; development and use of oil-electric locomotives; and the use of back pressure and initial pressure gages, including automatic cut-off control.

Design of Fundamental Parts

The committee, after meeting with the Committee on Wheels, recommends a flange and tread contour applicable to all rolled-steel and steel-tired wheels of locomotives and cars. This contour, which includes a reduction of flange height to one inch and elimination of the secondary chamfer, is shown in detail in the report of the Wheel Committee.

Pursuant to instructions from the Mechanical division, the Committee on Locomotive Construction recommends a proposed design of eccentric crank for locomotives to avoid the use of transverse bolts passing entirely or partially through the crank pin. The design suggested accomplishes this result with the least possible departure from consecutive and proven practices, but is purely tentative and has not yet been tested in service.

A discussion of the design of drawbars and connections between engine and tender is included in this part of the committee's report. It covers drawbars, safety bars and chains, and affords simple formulas for determining the proper dimensions and proportions of these important parts.

Formulas for use in designing drawbars.—Area in sq. in. through body of bar

$$= \frac{T}{3{,}000} \text{ or } = \frac{W}{18{,}000}$$

Where: T = Tractive force in pounds.
W = Total weight of engine loaded in pounds.

Use the largest area obtained by either method.

These formulas apply to central safety bar as well as draw bar.

A simple formula for diameter of pin in inches is:

$$E = \frac{T}{4{,}500 \times B}$$

Where: T = Tractive force in pounds.
B = Depth of bar.
E = Diameter of pin.
4,500 = Bearing pressure per square inch.

Where the depth of pocket is not more than ½ in. greater than thickness of draw bar.

Formulas for designing draw- and safety-bar pin considered as a beam fixed at both ends:

For the condition of bending,

$$M = \frac{TL}{8}$$

and $Z = .1d^3$ (actually $.098d^3$)

$$S = \frac{M}{Z} = \frac{\frac{TL}{8}}{.1d^3} = \frac{TL}{.8d^3}$$

$$\text{or } d = \sqrt[3]{\frac{TL}{.8S}}$$

Where: S = Tensile stress in lb. per sq. in.
M = Bending moment.
T = Tractive force in lb.
L = Depth of pocket in in.
Z = Section modulus.
d = Diameter of pin in inches.

Assuming working stress of 4,500 lb. per sq. in. and allowing ¼ in. on the diameter of the pin for wear:

$$d = \sqrt[3]{\frac{TL}{3{,}600}} + \tfrac{1}{4}'' \text{ (formula for bending)}$$

For the condition of shear,

$$F = T \times \frac{L - H}{L}$$

$$\text{and } S1 = \frac{F}{.8d^2} \text{ (actually } .7854d^2).$$

Where: S1 = Shearing stress in lb. per sq. in.
F = Maximum shearing load in lb. per sq. in.
H = ½ the depth of bar eye in inches.

A shearing stress is usually taken as 0.8 of the tensile stress when considering wrought iron or steel. Then:

$$d = \sqrt{\frac{\frac{T \times L - H}{L}}{.8 \times .8 \times 4{,}500}} + \tfrac{1}{4} \text{ in.}$$

$$= \sqrt{\frac{\frac{T \times L - H}{L}}{2{,}800}} + \tfrac{1}{4} \text{ in. (formula for shear).}$$

Both calculations should be made and the maximum figure used for diameter of pin.

Formula for use in designing safety bars:

Area in sq. inches through body of bar

$$= \frac{T}{2 \times S} \text{ or } = \frac{W}{22{,}500}$$

Where: T = Tractive force in pounds.
S = 3,750-lb. maximum fiber stress per sq. in.
W = Total weight of engine loaded in pounds.

Formula for determining the proper size of links in a safety chain:

$$A = \frac{T}{.75\ S \times 4}$$

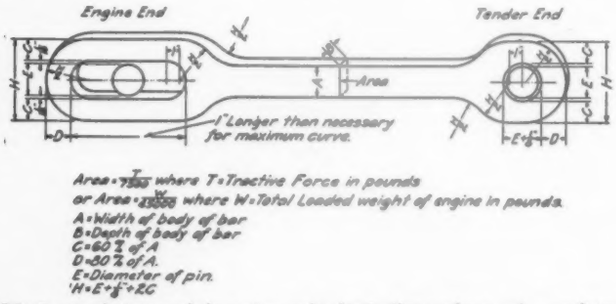
Where: A = Area of bar of which link is made.
T = Tractive force.
S = Maximum working fiber stress = 3,330 pounds per square inch.

The committee report includes a standard design and specifications for 300-lb. globe and angle valves for steam locomotives. The factor of safety for the valve design suggested by the committee ranges from 16 for the ¾-in. valve to 9 for the 3-in. valve, with intermediate sizes in proportion. This is said to be not a breakage factor but a leakage factor, that is, the point at which leakage will occur around the valve bonnet.

The recommendations of the committee for a standard valve for pressures higher than 300 lb. could not be covered by the committee this year and are planned for presentation in a subsequent report.

High Boiler Pressures

This part of the report covers a study of 2,889 locomotives with conventional-type fireboxes, including one locomotive with 325 lb. pressure; 90 with 275 lb. pressure; 1,416 with 250 lb. pressure; and 713 with 225 lb. pressure. Considerable informa-

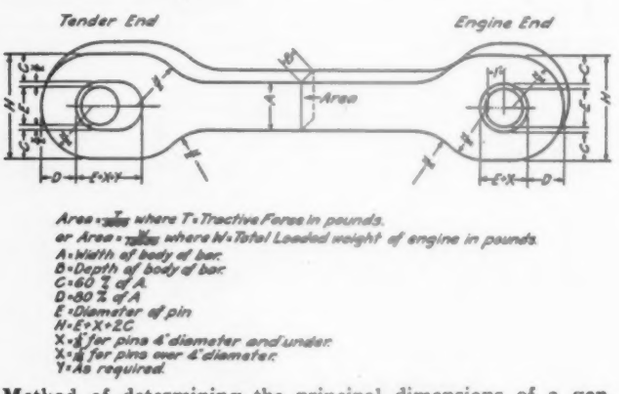

Engine End
Tender End
Area
1" Longer than necessary for maximum curve.
D
E+f+D
Area = T/7500 where T = Tractive Force in pounds
or Area = W/12000 where W = Total Loaded weight of engine in pounds.
A = Width of body of bar
B = Depth of body of bar
C = 60 % of A
D = 80 % of A
E = Diameter of pin
H = E+f+2C

Method of determining the principal dimensions of a safety bar

tion regarding high-pressure locomotives used on 21 individual roads is included in the report; also a discussion of multiple-pressure locomotives and water-tube firebox boilers on the Baltimore & Ohio.

This part of the report is concluded with the following discussion of the advantages and disadvantages of high boiler pressure.

"Within reasonable limits of high steam pressure for locomotives, the amount of energy that can be stored in a given quantity of steam is increased by increasing the pressure and temperature of the steam, consequently less water is required to develop a given amount of power. The increasing power developed is obtained by expanding the steam to a greater degree in the cylinders. Greater capacity engines can be designed for the same weight and more efficient use of the steam secured, through smaller cylinders, valve chambers and steam pipes with reduced area through which heat can be lost to the atmosphere by radiation.


Tender End
Engine End
Area
D
E+X+Y
E+X+D
Area = T/7500 where T = Tractive Force in pounds.
or Area = W/12000 where W = Total Loaded weight of engine in pounds.
A = Width of body of bar.
B = Depth of body of bar.
C = 60 % of A.
D = 80 % of A
E = Diameter of pin
H = E+X+2C
X = ½" for pins 4" diameter and under.
X = ¾ for pins over 4" diameter.
Y = As required.

Method of determining the principal dimensions of a generally satisfactory form of drawbar

"Disadvantages include: difficulty with cylinder and valve lubrication causing increased maintenance, necessitating stronger globe valves, pipe and cab fittings, etc. It may be desirable and probably necessary to discard the piston valve, in favor of some form of valve such as the poppet valve, which does not require lubrication."

Oil-Electric Locomotives

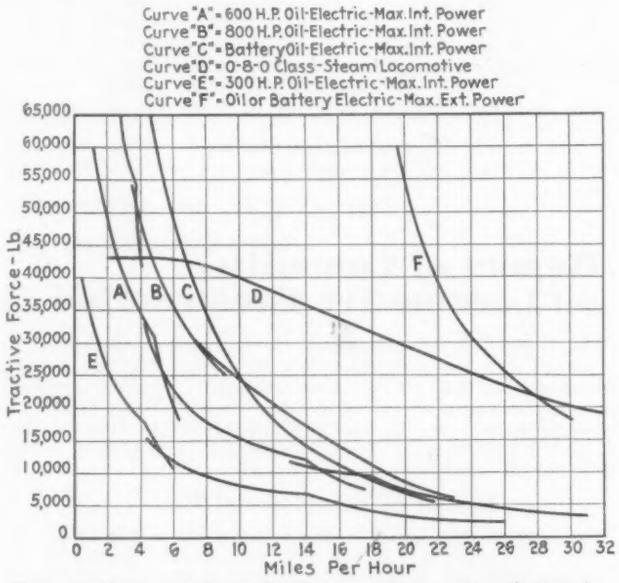
The report includes a careful record of information secured from manufacturers and users of oil electric locomotives entirely apart from gasoline-operated machines of the same general character. This information is presented in tabular form, the first three tables covering 300-hp. locomotives on 13 roads; the next two tables, 600- and 800-hp. locomotives on 8 roads. One of the charts shows graphically the total number of oil-electric locomotives in railroad service and the horsepower rating for all of these machines in the United States for the years 1925 to 1931, inclusive. As shown in the chart, the total number of locomotives as of January 1, 1932, is about 96 and the aggregate engine horsepower approximately 62,000. The report also includes a chart showing comparative speed-tractive-force curves for the oil-electric locomotive and the steam locomotive which it replaces. The greater starting effort available is illustrated; also, the lower hauling capacity at speeds above 8 m.p.h.

In discussing the comparative costs of oil-electric and steam operation in identical switching service, the committee reports: "From this it will be observed that the first costs of the oil-electric locomotives are considerably higher on the horse-power basis and the total operating costs per hour, including fixed charges and depreciation, while showing considerable fluctuation, are somewhat less than steam operation costs per hour. It is evident that with the higher availability for service possible from the oil-electric locomotives, and lower terminal expense for standby losses, the use of the oil-electric locomotive provides more hours of service with efficient and economical performance."

The report calls attention to the steadily improved design of the steam locomotive, resulting in a highly efficient machine for all classes of transportation, including local and terminal service now handled by oil-electric power. From the standpoint of smoke and noise prevention, the oil-electric locomotives have an important advantage for terminal and city-yard operations, tunnel runs and transfer operations in yards adjacent to residential sections.

Cut-Off Control

Referring to a cut-off control device automatically operated by the back pressure, the report states that 96 units of this device are in service at the present time on 13 railroads. The



Comparative speed-tractive-force curves of oil-electric, battery-oil-electric and steam switching locomotives

report approves the general principle of operation of this device and states that its mechanical features, while somewhat complicated, are not objectionably so.

Another device, of which 600 units are in service on 16 railroads, is one whereby the proper cut-off is indicated by the speed of the locomotive. The report states that while this device does not control the cut-off automatically, it gives clear indications to the engineman on a cab gage of the adjustment in cut-off which is required to obtain the maximum power available corresponding to the locomotive speed. Regarding the performance of this device, the report states: "Successful results are obtained when the engineman pays strict attention to the indications of the control gage and handles his reverse gear accordingly. A careful check of the records from this device are helpful in designating those enginemen who need instruction in operating methods. Reports from sev-

eral railroads using this device indicate a substantial saving in fuel, as well as an increase in tonnage rating for engines using this device."

The report concludes with a brief discussion of the general use of back-pressure gages as a guide to locomotive operation in obtaining maximum fuel economy and increased tonnage.

The report was signed by W. I. Cantley (chairman), mechanical engineer, Lehigh Valley; H. H. Lanning (vice chairman),

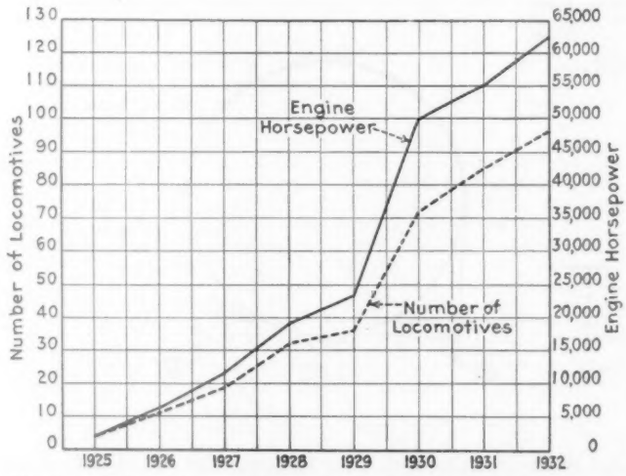


Chart showing the number and aggregrate horsepower of Diesel-electric locomotives in the United States

mechanical engineer, Atchison, Topeka & Santa Fe; H. A. Hoke, assistant mechanical engineer, Pennsylvania; G. McCormick, general superintendent motive power, Southern Pacific; E. C. Anderson, mechanical engineer, Chicago, Burlington & Quincy; W. G. Black, mechanical assistant to president, Chesapeake & Ohio; C. E. Brooks, chief motive power, Canadian National; G. H. Emerson, chief motive power & equipment, Baltimore & Ohio; A. H. Fetters, general mechanical engineer, Union Pacific; R. M. Brown, superintendent motive power, New York Central, and S. S. Riegel, mechanical engineer, Delaware, Lackawanna & Western.

Discussion.—The necessity of two bolts through the eccentric-crank head to obtain the required fit on the crank pin was questioned and Chairman Lanning stated that the eccentric crank was slotted on the center line to give both bolts effective draw. He said that the collar and longitudinal bolt through the crank pin are necessary as a safety measure to assist in holding the eccentric crank and particularly the keys in place, preventing the latter from working out and striking the eccentric rod.

In connection with that part of the report devoted to higher boiler pressures, the necessity of a boiler of a type differing from the conventional design was questioned, and the proper treatment of water suggested as the simplest way to reduce maintenance. On one road where all waters have been treated for several years, broken staybolts amount to only a little over two per engine per year.

Action.—The report of the committee was accepted.

Report on Loading Rules

As a result of meetings held with shippers and investigations conducted during the past year, the committee recommends changes in the loading rules as hereafter outlined.

General Rules for Loading Materials

Rule 13—Revise tables on pages 9 and 10 to have length of overhang coincide with Rule 23; also add to these tables 26 ft., 28 ft. and 30 ft. overhang on cars 50 ft. long or over.

Rule 23—Revise tables on pages 13 to 19 inclusive to provide for 26 ft., 28 ft. and 30 ft. overhang on cars 50 ft. long or over and corresponding widths and weights. Also add a table showing length of overhang, widths and weights on 60,000 lb. capacity flat cars.

Rule 30—Eliminate the last two lines following the letter D, from the headings over cuts on pages 25, 29, 33, 37, 41, 45, 49, 53, 57, 61 and 65 and substitute the following note to follow section (c): *"Note*—The following data was based on tables, pages 18 and 19, of the 1928 code."

Revise drawings and tables on pages 26, 27, 28, 30, 31, 32, 34, 35, 36, 38, 39, 40, 42, 43, 44, 46, 47, 48, 50, 51, 52, 54, 55, 56, 58, 59, 60, 62, 63, 64, 66, 67 and 68, to provide for intermediate lengths of loads and from 1 in. to 3 in. clearance on sides of loads.

The committee submitted revised tables in accordance with recommendations for changes in Rules 13 and 23. Loading diagrams were included in the report together with the necessary tables of dimensions for twin and triple loads when placed on cars 30 ft. 0 in. to 58 ft. 9 in. inclusive over the end sills; similar tables were included for twin loads only on cars 64 ft. 0 in. long to 72 ft. 0 in. long inclusive over end sills.

Group II—Loading of Structural Material, Billets, Wheels, Pipe, etc.

Rule 201—Revise first sentence of this rule to read as follows: "Plates too wide to be loaded flatwise on gondola cars may be loaded flat on flat cars, the load being held in place by 4-in. by 6-in. straight grain hardwood clamps, not more than *7 ft.* apart, extending across car, substantially secured by ¾-in. bolts passing through the stake pockets.

Rule 214—Revise this rule to read as follows: "If the overhang (C) exceeds one-third the total length (L) of load, as per Fig. 52, 54 and 55, the opposite end must be *secured by means of a 4-in. by 6-in. clamping piece and ⅞-in. bolts extending through car floor, and held underneath by 2-in. by 4-in. by 12-in. cleats and cut washers.*"

Rule 217—Change third sentence of second paragraph to read as follows: "For floor loads the bearing piece should be placed on the car floor over the car body-bolster or between the car body-bolsters, except that for flexible material *and for rigid material not exceeding one-half the capacity of the car* the bearing-piece may be located 12 in. beyond bolster on steel and steel underframe cars."

Rule 224—Change second sentence of first paragraph to read as follows: "The bolster shall not be less than 12 in. wide and of sufficient height to provide the necessary 4-in. clearance between lading and floor or end gates of idle *car,* but in no case must the height exceed the width. See Fig. 59 and 60 for method of applying bolsters and braces."

Rule 228—Change the last sentence of this rule to read as follows: "Overhanging portion of the loads must be provided with a minimum clearance *at end of the load between the load and car sides as specified in tables under General Rule 30.*

Also eliminate second sentence from the note under this Rule and substitute the following: *"The minimum side clearance at the ends and centers of such loads shall be as shown in General Rule 30 for a total length of load equal to the distance between the bearing timbers plus twice the length of the longest overhang."*

Rule 238—Revise list of material shown on page 182 of Loading Rule Book. *Reason*—To meet present requirements, and correcting errors in connection with designating letters F, G, J and L. A sketch showing the parts required for loading girders and a revised list of material was included in the report.

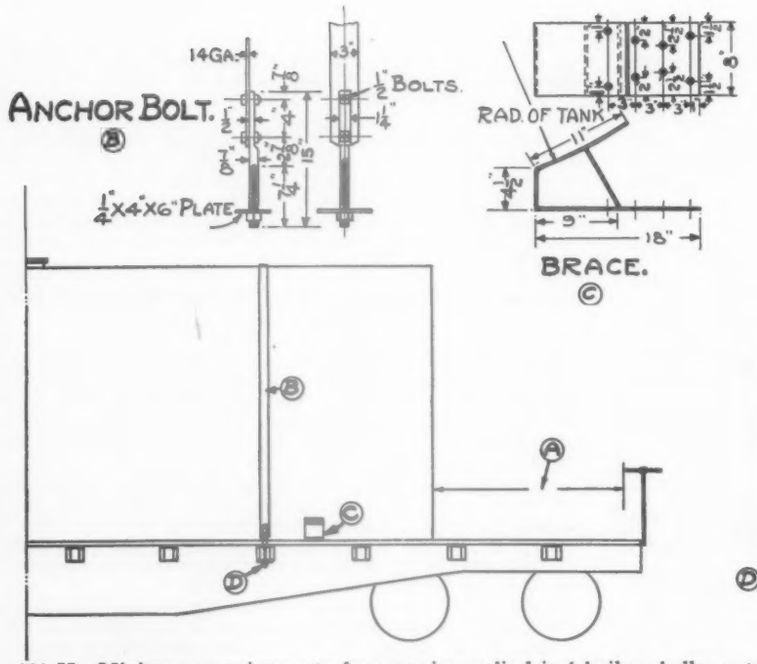
Rule 242—The list of material shown on page 197 of the Loading Rule Book is revised to meet present requirements and to correct errors in connection with designating letters F, G, and H. A revised list of material was included in the report.

Rule 249—The proposed form for the revision of Rule 249 affects the following paragraphs of the rule as noted: "All stakes must extend sufficiently above the load to tie together with wire and must be equally spaced." To this paragraph is added the sentence, *"Wire must be twisted taut."*

To the paragraph reading, "Not less than six strands, three wrappings, of ⅛ in. diam. wire, or two strands, one wrapping of 3/16 in. diam. wire shall be used for all cross or intermediate ties" it is proposed to add the sentences, *"Wire must be in good condition and ends twisted taut. The bolt or pipe used for twisting the wire must be secured so that it cannot work loose in transit."*

In the paragraph referring to intermediate wiring—Gondola Cars, Fig. 80, Sketch "A", the sentence referring to the location of cross wire is revised to read as follows: *"The location of this cross wire must be on top of the first tier extending wholly or partially above the car sides."*

The section of the Rule referring to Bearing Pieces and Intermediate Wiring—Gondola Cars, Fig. 80, Sketch "B", it is proposed to revise to read as follows: "Bearing pieces not less than 1-in. by 4-in. must be placed not *more* than 6 ft. apart between each tier of pipe, extending full width of load. When this method is used each pair of stakes must be securely wired together at top of load, and when load extends more than 4 ft. above sides of car, one intermediate tie wire must be located approximately midway between top



Item	No. of Pcs.	Description
A		Brake wheel clearance. See Fig. 1.
B	2	Bands with threaded ends as shown.
C	4	Steel side braces secured with lag screws or spikes of ¼ in. dia.
D	4	Washer plates ¼ in. x 4 in. x 6 in.

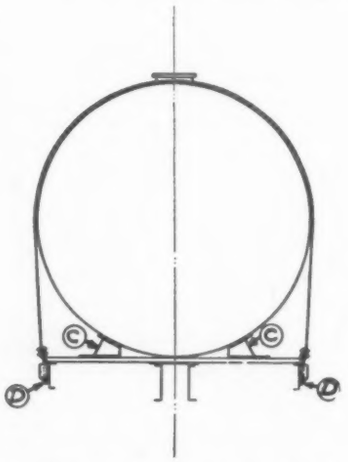


Fig. 101-H—Minimum requirements for securing cylindrical boiler shells or tanks with steel blocking and bands—Flat cars

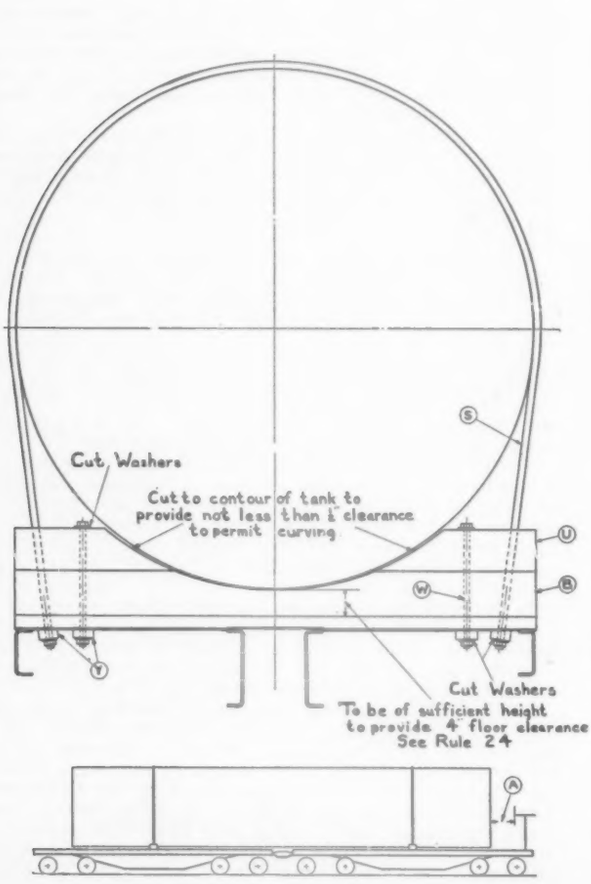
of car side and top of load. Pipe must completely fill the space between the stakes; to accomplish this, fillers, the same width as stakes and thickness to suit, must be securely nailed to outside face of stakes. *When pipe in top row does not completely fill the space between the stakes, blocks not less than 1-in. by 4-in. by 4-in. must be placed against the pipe and nailed to both ends of each bearing piece."*

Rule 250-A—Add new paragraph to follow fourth paragraph reading as follows: *"Bearing pieces not less than one in. by four in. extending across full width of load, not more than six ft. apart, between each tier, may be used."*

Rule 262—Revise Fig. 87 to show load in a four-door hopper car. [A sketch was included in the report.—EDITOR.]

Group III—Loading Mine Cars, Engines, Etc.

Rule 302—Add Rule 24 to General Rule reference and add paragraph 8 to read as follows: *"Long cylindrical commodities weighing not more than 30,000 lb. and not over 80 ft. in length and which would not become damaged due to being loaded on stationary bolsters, when loaded on two cars may be loaded and secured in accordance with Fig. 100-A. Long cylindrical*


Cut Washers
Cut to contour of tank to provide not less than 1" clearance to permit curving
Cut Washers
To be of sufficient height to provide 4" floor clearance
See Rule 24

READING COMPANY
SK-4389 FEB 29,1932
METHOD OF LOADING LONG CYLINDERS ON FLAT CARS

List of Material			(One Stationary Bolster)
Name of Part	Designation	No. Req'd.	Loads Must Not Exceed 30,000 Lbs. & 80 Ft. in Length
Brake Wheel Clearance	A		Not Less Than 6" See Fig. 1
Bolster	B	1	Not Less Than 10"x12"
Clamping Rods	S	1	1" Diameter
Chock Blocks	U	2	Not Less Than 6" High Same Width as Bolster
Chock Block Bolts	W	2	¾" Dia.- Length to Suit
Bolster & Clamping Rod Cleats	Y	4	2"x 4"x18"

Fig. 100-A—Method of loading long cylindrical commodities on two cars on stationary bolsters

commodities weighing more than 30,000 lb. when loaded on two or more cars, must be loaded on pivoted bolsters and secured in accordance with Fig. 100-B."

Also add paragraph 9 to read as follows: *"Steel bracing and bands as per Fig. 100-H, may be used for tanks more than eight ft. in diameter."*

Rule 302-A—It is proposed to revise Rule 302-A as follows: To the paragraph reading, "Small diameter tanks loaded longitudinally on floor of car" is added "on floor of *flat or gondola cars."* In that section of the Rule referring to Fig. 101-A, it is proposed to revise paragraph two to read as follows: "Two tanks may be loaded longitudinally (side by side) on flat or gondola cars, *as per illustration No. 1."*

In the next paragraph a revision is proposed to make the first sentence of the paragraph read as follows: "Tanks, loaded three per pile in pyramidal form, *as per illustration No. 2,* must be secured with two rods or bands, etc., etc." The remainder of this paragraph is unchanged.

It is proposed to revise the succeeding paragraph to read as follows: "Tanks, loaded three per pile in pyramidal form, *as per illustration No. 3 (in gondola cars only),* must have the tanks in the floor layer placed against the sides of car. *In no case must the diameter of top tank, which completes the pyramid, be greater than inside width of car.* Tanks of equal diameters in each pile shall be secured with two rods or bands on end piles and one rod or band on intermediate piles. When diameter of top tank exceeds diameter of bottom tanks, or where piles made of tanks more than 12 ft. in length, two rods or bands shall be used on intermediate piles."

It is proposed to change the next paragraph to read: "Tanks 12 ft. or less in length loaded six per pile in pyramidal form, *as per illustration No. 4,* shall be secured with two rods or bands. Tanks more than 12 ft. in length shall be secured with three rods or bands."

It is proposed to change the next paragraph to read as follows: "Rods securing two tanks loaded longitudinally (side by side), or not more than six tanks loaded in pyramidal form, *as per illustrations No. 1, 2, 3 and 4,* shall not be less than ⅝ in. in diameter, or bands of equal strength with threaded ends. Each of these bands or rods may be substituted with high tensile strength steel bands not less than 2 in. in width, or wires having a total ultimate tensile strength of 7,200 lb."

It is proposed to change the next paragraph to read as follows: "Tanks, 12 ft. or less in length loaded, *as per illustrations No. 5, 6, 7 and 8,* shall be secured with two rods per pile, ¾ in. in diameter, or bands of equal strength, with threaded ends. Tanks more than 12 ft. in length, shall be secured with three rods per pile, ¾ in. in diameter, or bands of equal strength, with threaded ends. Each of these rods or bands may be substituted with high tensile strength steel bands, not less than 2 in. in width, having a total ultimate tensile strength of not less than 7,200 lb. In addition to these securements, *when loaded as per illustrations No. 5, 6, and 8,* each pile 12 ft. or less in length shall be tied into a unit with one high tensile strength steel band entirely around each pile at center. Piles exceeding 12 ft. in length shall be tied into a unit with two additional high tensile strength steel bands entirely around each pile about ¼ the length of tanks from each end. *When loaded as per illustration No. 7 (in gondola cars only), the same number of high tensile strength steel bands shall be used in each case and all such bands shall be secured to the car sides. If necessary additional stake pockets or 3-in. by 3-in. by ¼-in. angles 6 in. long must be applied."*

In the next paragraph reading, "If high tensile strength bands or wires, etc." the word "steel" is added after the words "high tensile strength" and preceding the words, "bands or wires."

It is proposed to change the next paragraph in the rule to read as follows: "Each layer of tanks, when not loaded in pyramidal form, must be separated by at least two, 3-in. by 4-in. bearing timbers. When loaded *as per illustrations Nos. 5 and 6,* must have 4-in. by 6-in. chock blocks spiked to top and bottom of each bearing timber. *When loaded as per illustration No. 7 must have 4-in. by 6-in. chock blocks spiked to top and one 4-in. by 4-in. block, of sufficient length to come in contact with tanks in bottom layer, spiked to bottom of each bearing timber."*

In the paragraph reading, "Tanks, when not loaded in pyramidal form must have tanks in the upper layer directly above those in lower layer" it is proposed to add the words, *"except when loaded as per illustration No. 7."*

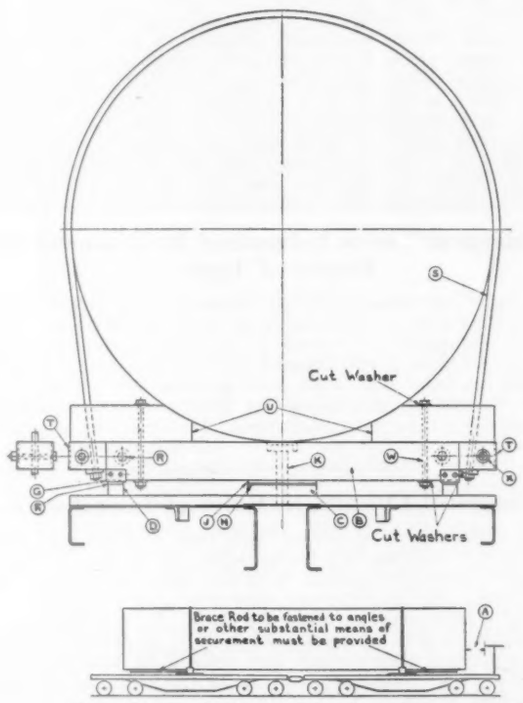
In the last paragraph of the rule, referring to Note 2, it is proposed to add the words *"above car sides on gondola cars and above floor on flat cars."*

Rule 305—It is proposed to revise Fig. 104 as shown in a sketch included in the report.

Rule 306—Revise Rule 306, Section (a), to read as follows: "When a derrick, crane, steam shovel and similar pivoted machinery, except wrecking cranes, is shipped on its own wheels, having a boom that extends more than 30 ft. beyond the end sill of its truck frame, the boom must be detached from the rotating portion. *When detached boom is loaded on adjacent car and cables are not removed so as to completely separate the boom from the derrick car, the uncoupling apparatus on the couplers between the two cars must be disconnected so as to make them completely inoperative as per Fig. 104-B, or locked as per Fig. 4-A or 4-B.* Where the boom extends 30 ft. or less beyond the end sill of the crane or steam shovel truck frame, it may be left attached to the rotating portion under the following conditions:"

The report was signed by Samuel Lynn (chairman), superintendent rolling stock, P. & L. E.; R. H. Dyer, general car inspector, N. & W.; E. J. Robertson, superintendent car depart-

READING COMPANY
DR. 4388 MARCH 1, 1932.
METHOD OF LOADING LONG CYLINDERS ON FLAT CARS



List of Material (One Pivoted Bolster)						
Name of Part	Designation	No. Req'd.	Loads not Weighing More Than 30000 Lbs.	Loads More Than 30,000 Lbs. And Not Exceeding 72,000 Lbs.	Loads More Than 72,000 Lbs. And Not Exceeding 115,000 Lbs.	Loads More Than 115,000 Lbs. And Not Exceeding 200,000 Lbs.
Brake Wheel Clearance	A		Not Less Than 6" See Fig1	Not Less Than 6" See Fig1	Not Less Than 6" See Fig1	Not Less Than 6" See Fig1
Bolster	B	1 -	8"x10"x9'-6" Wide	10"x14"x9'-6" Wide	12"x16"x9'-6" Wide	14"x20" or Equivalent in Steel
Center Plate Backing	C	1	3"x12"x5'-0"	3"x12"x5'-0"	3"x12"x5'-0"	4"x12"x5'-0"
Side Bearing Backing	D	2	3"x10"x5'-0"	3"x10"x5'-0"	3"x10"x5'-0"	4"x10"x5'-0"
Side Bearing Bottom Plate	F	2	6"x⅝"x3'-6"	6"x⅝"x3'-6"	6"x⅞"x3'-6"	6"x⅞"x4'-0"
Side Bearing Top Plate (Bent)	G	2	6"x¼"x1'-3"	6"x¼"x1'-7"	6"x¼"x1'-9"	6"x⅜"x2'-1"
Center Plate Bottom	H	1	12"x⅜"x12"	12"x⅜"x12"	12"x⅜"x12"	12"x½"x12"
Center Plate Top	J	1	12"x⅜"x12"	12"x⅜"x12"	12"x⅜"x12"	12"x⅜"x12"
Center Pin	K	1	2½" Dia.	2½" Dia.	2½" Dia.	2½" Dia.
Bolts For Center Plate Backing	P	6	¾" Dia.	¾" Dia.	¾" Dia.	¾" Dia.
Brace Rods	R	2	1" Rod or 2½"x½" Flat	1⅛" Rod or 3"x⅝" Flat	1¼" Rod or 3"x⅝" Flat	1⅜" Rod or 3"x¾" Flat
Clamping Rods	S	1	1" Dia.	1⅛" Dia.	1¼" Dia.	1⅜" Dia.
Bolster Plates	T	2	4"x6"x1'-6" Bent To Fit Bolster	4"x7"x1'-10" Bent To Fit Bolster	4"x9"x2'-0" Bent To Fit Bolster	4"x10"x2'-4" Bent To Fit Bolster
Chock Blocks	U	2	Not Less Than 10" High Same Width as Bolster	Not Less Than 10" High Same Width as Bolster	Not Less Than 10" High Same Width as Bolster	Not Less Than 10" High Same Width as Bolster
Chock Block Bolts	W	2	¾" Dia.	¾" Dia.	¾" Dia.	¾" Dia.
Bolster Split Bolts	X	2	⅝"x12"	⅝"x16"	⅝"x18"	⅝"x22"

Fig. 100-B—Method of loading long cylindrical commodities on two or more cars on pivoted bolsters

ment, M. St. P. & S. Ste. Marie; G. R. Lovejoy, master mechanic, D. T.; T. O. Sechrist, assistant superintendent machinery, L. & N.; G. J. Nelson, superintendent of interchange, Chicago Car Interchange Bureau; R. B. Rasbridge, superintendent car department, Reading; W. B. Moir, chief car inspector, Penna.; and J. A. Deppe, assistant superintendent car department, C. M. St. P. & P.

Discussion.—A suggestion was made that operating officers, particularly agents, should have the loading rules placed in their hands because inspectors are unable to determine how box cars are loaded. In answer to this suggestion, Chairman Lynn called attention to the fact that the committee is dealing with commodities mostly loaded in open cars, whereas the loading and packing requirements of most of the commodities loaded in box cars are covered in the tariffs. He referred to the fact that some joint study is being given to these problems.

Action.—The report was accepted and the recommended changes in rules submitted to letter ballot.

Report of Committee On Tank Cars

During the year the Committee on Tank Cars considered a total of 130 dockets and applications for approval of design of which 81 applications covered new cars or new tanks for existing cars of the following classes:

Class	No. of Cars
ICC-103	264
ICC-103A	45
ICC-103B	5
ICC-103C	2
ICC-104	1
ICC-104A	15
ICC-105A300	46
ICC-105A400	5
ICC-105A500	9
ICC-106A500	2
ICC-107A3350	6
ARA-201A35	6
ARA-203	50
Armco Iron	1
Two, 2,000-gal. tanks mounted on one narrow gage wood underframe flat car	1
Total	458

Twenty-seven applications covered alterations in existing equipment consisting of: Application of heater coils, application of insulation, application of rubber lining, application of safety valves in place of vents, application of new domes of increased capacity, application of bottom discharge outlets in place of washout castings, and conversion to compartment cars.

Reduction in capacity from 10,000 to 8,000 gal. for the classes and number of cars following:

Class	No. of Cars
ARA-II	2
ARA-III	123
ICC-103	18
	143

And 22 applications for approval of tank car appurtenances as follows:

Applications	Tank-Car Appurtenances
8	Dome covers
7	Dome cover safety devices
1	Steel running boards
1	Heater coils
1	Safety valves
1	Bottom outlet valve
1	Placard holder
1	Heater coil cradle supports
1	Steel tubing for heater coils

Forge-Welded Tanks

Extensive tests have recently been completed on all the forge-welded tanks and plates submitted and your committee, as a result of the reports rendered, has recommended to the Interstate Commerce Commission a modification in container specification 105-A to permit the use of natural gas into which superheated steam has been introduced for the fabrication of this class of container, suggesting that this portion of the specification read as follows: "*Welding.*—All seams must be lap welded by the water gas process or other approved method, hammered or rolled."

Fusion-Welded Tanks

During the tests of forge-welded tanks the committee was fortunate in interesting three builders of electric fusion welded vessels, and these companies submitted miniature tanks of the same dimensions as the forge-welded tanks. The tests of these tanks made along the same lines as the tests of the forge-welded tanks indicated that tanks fabricated by this method when properly constructed would satisfactorily meet the requirements for safety and service. Your committee will continue this study with a view of preparing tentative specifications.

In the meantime your committee is recommending to the Interstate Commerce Commission that permission be given for the fabrication of 10 Class ICC-105A400 fusion-welded tanks for experimental service in transporting regulatory commodities in which the A. S. M. E. specification for fusion-welded non-fired pressure vessels, including x-ray examination of all welded seams, will be followed.

Approved Dome Closures and Safety Devices Therefor

Your committee has completed its check of designs of dome closures, proposed to bring equipment into compliance with the requirement of paragraph 243(c) of the Interstate Commerce Commission Regulations for Transportation by Rail of Explosives and Other Dangerous Articles in Freight Service. The secretary has issued to all tank car owners and operators a circular letter, dated September 8, 1931, listing those dome covers and dome cover safety devices which in the opinion of your committee adequately meet these requirements. Revision of this list will be issued from time to time as additional dome covers and safety devices are approved.

Extension of Effective Dates for Tank Car Requirements in Interchange Rule 3

The Tank Car Committee after due consideration of the requests from various car owners for extension of time in which to meet the provisions of Interchange Rule 3 covering headblock anchorage recommended to the Arbitration Committee, in view of the present economic situation, that a further extension of one year be granted.

On the owners' request for an extension of time in which to alter existing tank cars having wooden shims between the longitudinal anchorage and the underframe, your committee recommended that a further extension of time be granted even though it had previously been stated that no such extension would be granted.

Specifications for Class ICC-107A Cars

During the year your committee, not satisfied with the factor of safety permitted in containers constructed under specification ICC-107A3350, made formal request of the Interstate Commerce Commission for a cancellation of this specification. A hearing was held before the ICC for the purpose of permitting all parties concerned to present their views.

Following this hearing the Commission issued its order cancelling specification ICC-107A3350 and promulgating specification ICC-107A **** effective April 14, 1932.

Specification ICC-107A**** incorporates in it a definite relation between minimum ultimate strength of the tank material and maximum stress produced by the lading under maximum temperature encountered. This specified relation is equivalent to a factor of safety of 3.6 at 130 deg. F. or 4.0 at 70 deg. F.

The Interstate Commerce Commission order further directs that the present helium tank cars, of which there are eight, shall have the loading pressure adjusted so as to operate at the same factors of safety as required for new cars. This is already being arranged for and will be completed shortly.

Leakage of Safety Valves and Development of Improved Types

The Sub-Committee on Safety Valves is continuing its work toward developing a safety valve so as to overcome the objections of the present standard valve showing slight leakages at the seat before predetermined internal pressure is reached, also that the valve seats tight after pressure is relieved.

Several types of gasketed safety valves are now extensively used and others are being developed; further study is also being made to determine the life of valve gaskets now in use with a view of establishing a time renewal period.

Suggested Changes in Rules of Interchange

Your committee is receiving from time to time applications for approval covering new tanks which are to be mounted on old underframes and trucks. It is felt when this is done these underframes, due to their age, must be in good condition and made to comply with at least the A. R. A. specifications for Class III tank cars, effective May 1, 1917, to July 1, 1927, and your committee recommends that Rule 3 be modified to require this on all future applications of new tanks to old underframes and trucks.

Similarly, where the old trucks are of the arch bar type,

your committee recommends that Rule 3 be modified to require that when new tanks are applied to old underframes and trucks, the trucks must be equipped with cast steel side frames meeting A. R. A. specifications.

Patching of Tank Cars

The Committee on Tank Cars has continued its study of this subject, but is not ready to submit its recommendations due to the many factors involved.

The report was signed by G. S. Goodwin (chairman), assistant to general superintendent motive power, Chicago, Rock Island & Pacific; A. G. Trumbull, chief mechanical engineer, Chesapeake & Ohio; G. McCormick, general superintendent motive power, Southern Pacific; W. C. Lindner, chief car inspector, Pennsylvania; A. E. Smith, vice-president, Union Tank Car Company; T. Beaghen, Jr., superintendent car maintenance, Mexican Petroleum Corporation; G. E. Tiley, supervisor tank car equipment, General Chemical Company; C. C. Meadows, master car builder, Tidal Refining Company; F. A. Isaacson, engineer car construction, Atchison, Topeka & Santa Fe; G. A. Young, head, School of Mechanical Engineering, Purdue University, and F. Zeleny, engineer of tests, C. B. & Q.

Action.—The report was accepted.

Report of Committee on Wheels

The report of the Committee on Wheels is featured, this year, by important recommendations regarding cast-iron wheels, particularly as relates to the depth of chill. Minor changes and refinements in the manufacture of wrought-steel wheels are reported and a new A.R.A. standard tread and flange contour suggested, in which the elimination of the chamfer promises to effect substantial reductions in thermal checking under heavy brake applications.

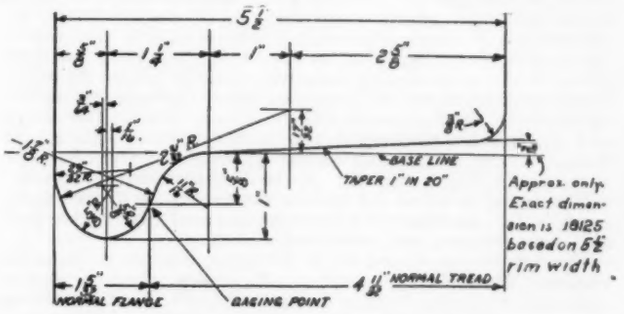
Chilled Car Wheels—"One feature of the specifications which has caused considerable controversy is a correct and uniform interpretation of Sec. 2, Par. C, specifying chill limits. The manufacturers have been experimenting and testing various schemes for standardizing the depth-of-chill measurements and have finally developed a set of full-size photographs illustrating clearly various degrees of chill depth, with complete identification of each illustration and a standardized indication of the actual chill depth. A complete set of the photographs with the key to the standardized measurements has been furnished to each wheel foundry represented in the association. The manufacturers' associations has, in addition, furnished three photographs illustrating minimum, normal and maximum chill wheels which are reproduced in this report for the information of cast-iron wheel foundries operated by various railroad systems. The illustration shows (left to right) a minimum chill depth, namely ½ in.; normal chill depth, namely ¾ in., and maximum chill depth, namely 1¼ in.

"The collection and study of additional photographs will be continued by the manufacturers and this committee and further recommendations will be made in the next annual report. The subject is so important, however, that the committee recommends another revision of the cast-iron wheel specifications this year to clarify the intent of the 'chill' requirement. The present specifications refer to 'chill' as 'clear-white iron,' whereas various railroad and manufacturers' specifications refer to it as 'chill,' 'effective chill,' etc. The important change in the specifications, therefore, is the substitution of the word 'chill' for 'clear-white iron' in the first, second and third sentences of Par. C, Sec. 2, and in the second sentence of Sec. 6."

The committee report also suggests a revision of the specifications to define "drawn hubs" and to indicate a standard marking for cast-iron wheels.

Cast-Iron Wheel Defects and Condemning Limits—The committee acknowledges appreciation for the co-operation and assistance rendered by the Association of Manufacturers of Chilled Car Wheels and by various representatives of railroads and private car lines in the study and development of intermediate tread-defect limits and the new remount gage submitted by the Wheel Committee to the Arbitration Committee and recommended by that committee for submission to special letter ballot.

"The new remount gage for tread-worn hollow wheels is designed to prevent application of wheels to foreign cars when the depth of chill has been reduced by wear in excess of approximately 7/32 in., or about ½ the chill depth of a minimum chill wheel. It will also prevent the application of out-of-round wheels or wheels in the early stages of worn-through chill. On the other hand, the changes proposed in Rules 73, 74 and 82 will tend to conserve good second-hand wheels through specifying definite limits for brake-burn checks, comby and shelled spots and wheels now condemned as worn-through chill, on the basis of judgment rather than by gage."



A.R.A. contour with secondary chamfer element

Wrought-Steel Wheel Design—The committee, in co-operation with the Locomotive Construction Committee, proposes a design of standard tread and flange contour for all wrought-steel and steel-tired wheels in which the flange height has been reduced to one inch and the secondary taper eliminated. Regarding this new design (illustrated) the committee reports:

"The difference in flange thickness between the 1⅛-in. flange for driving and trailing wheels for road service and the proposed 1-in. flange, measured from the gaging point on the face of the flange to the back of the rim, is .025 in., as the nominal 1-in. flange is a trifle less in thickness at the gaging point, due to its 11/16-in. throat radius compared with the ⅝-in. throat radius specified for the 1⅛-in. flange. This is within the specification tolerance and will not affect existing standards for wheel spacing. The tread taper of 1 in 20 is maintained, but it is extended to the junction with the ⅜-in. radius at the front face of the wheel rim or tire with a total drop from the base of the flange to the front face of the wheel rim or tire of approximately 3/16 in.

"The purpose of the proposed change is to standardize all wrought-steel and steel-tired wheel tread and flange contours, with the consequent elimination of gages and turning tools. The design of the 1-in. flange will offer greater resistance to thermal checking of flanges under application of flanged brake shoes. The elimination of the secondary taper will increase the bearing area of the tread from 1⅞ in. to 3¼ in. and eliminate the break at the intersection of the two tapers. This should

Views illustrating various depths of chill in cast-iron wheels (Left to right): Minimum chilled depth ½ in., normal, ¾ in., and maximum, 1¼ in.

reduce the tendency to develop thermal checks, a large percentage of which center at this point on the present tread contour. Service tests which have been under observation since 1926 show very little, if any, difference in service life which can be attributed to tread taper or elimination of the secondary taper. The experience of a large eastern railroad, however, indicates practically complete freedom from thermal checking—a defect which is causing much concern on some railroads."

The committee also is considering a recommendation to standardize the tread and flange contour of all types of one-wear wheels.

The committee report includes a detailed discussion of thermal checks in wheel rims.

"The committee is requested to express an opinion relative to a proposed scheme for turning Davis cast-steel wheels. The subject has been investigated and data furnished which indicates that the strength of the Davis cast-steel wheel will equal the strength of a wrought-steel wheel through the throat to the underside of the wheel rim. In view of this data, it is the opinion of the committee that wheels of this type may be safely turned and reapplied to service by individual roads desiring to do so, providing sufficient metal is left in the rim to insure that the wheels will not wear below the condemning limit specified for wrought-steel wheels, namely 1⅛ in. for freight and 1⅜ in. for passenger cars, when measured through the throat to the critical line on the underside of the wheel rim, as shown in Fig. 4, page 261, of the 1932 interchange rules."

The report is concluded with recommendations regarding the symbols for marking defective cast-iron and cast-steel wheels, also wrought-steel and steel-tired wheels.

The report was signed by A. Knapp (chairman), inspecting engineer, New York Central; C. T. Ripley, chief mechanical engineer, Atchison, Topeka & Santa Fe; O. C. Cromwell, assistant to chief motive power and equipment, Baltimore & Ohio; H. W. Jones, general superintendent motive power, Central Region, Pennsylvania; H. W. Coddington, engineer tests, Norfolk & Western; J. Matthes, chief car inspector, Wabash; C. Petran, supervisor tools and machinery, Chicago, Milwaukee, St. Paul & Pacific; A. M. Johnsen, engineer tests, Pullman Company, and D. Wood, engineer tests, Southern Pacific.

Discussion.—The change in the wheel tread to a single unbroken taper, which the committee recommends be adopted for all standard multiple-wear wrought-steel and steel-tired wheels and which it is considering as a possible future application to the present standard single-plate cast-iron wheel, received considerable favorable comment. As the result of some objections to its immediate application to the cast-iron wheel, the chairman emphasized the fact that so far as this type of wheel is concerned, the committee is now seeking information on the basis of which it may present future recommendations.

The question of the depth of chill aroused extensive discussion. Most of those who referred to it commented favorably on the value of the photographs to which the committee referred as a means of securing more uniform interpretation of the depth of chill by different inspectors observing a single specimen. Some of the members, however, expressed their opposition on the increase in the depth of chill from 1 in. to 1¼ in. One member pointed out the fact that only 7/16 in. of tread wear is available before a wheel is condemned and that the deeper chill increases the liability of broken rims and flanges. As the discussion progressed, however, it was made clear that the photographs merely represent the present specifications, and that these specifications had to be drawn so that the manufacturers could practically comply with them. The less precision in judging the depth of chill, the wider the variation required. The comment in the discussion indicated a general acceptance of the idea that the photographs will increase the precision of measurement in inspections.

Some protests were expressed against the constantly increasing number of gages which are becoming a burden to inspectors. It was brought out, however, that the gage, referred to in the report of the committee, is not an inspector's gage, but is intended for use at the wheel shop only. Chairman Knapp of the Wheel Committee expressed sympathy with this situation and assured the members that the Wheel Committee was giving serious thought to the problem, but so far has found no practicable means for simplifying the gages.

Action.—The report was accepted and the recommendations of the committee submitted to letter ballot.

Report of the Arbitration Committee

During the year Cases 1684 to 1701, inclusive, have been decided and copies forwarded to the members.

Modifications of Rules 73, 74 and 82, to provide for the use of the new tread-worn-hollow gage for remounting cast-iron, cast-steel and one-wear wrought-steel wheels, recommended by the Committee on Wheels, were prepared by your committee in cooperation with the Committee on Wheels and submitted to letter ballot with the proposed gage, in order that the same might be placed in effect at the earliest possible date.

Joint conferences have been held during the year with representatives of the American Petroleum Institute, which resulted in recommendations for the revision of Rules 4, 32, 44 and 66, and new Rule 45.

Your committee desires to report progress in conjunction with the general subject of the simplification of accounting for car repairs, but directs attention to the modification of the labor and material rules as recommended in the report of the Committee on Prices for Labor and Materials, which will simplify pricing and should eliminate considerable correspondence in connection with billing. The suggested changes have been checked in detail by your committee and are recommended for adoption.

Attention is again directed to the fact that the Arbitration Committee will not consider questions under the rules of interchange unless submitted in the form of arbitration cases as per Rule 123.

All recommendations for changes in the rules of interchange submitted by members, railroad clubs, private-car owners, etc., have been carefully considered by the committee. Where approved, changes have been recommended. However, because of the late date when many of the suggestions were received this year, it was necessary to continue several of them on the docket for further consideration. Recommendations for changes should be in the Secretary's hands not later than March 15 of each year.

Rule 3—The committee recommends that the effective date of the seventh paragraph of Section (b) be extended to January 1, 1934, as follows:

Proposed form—Brake beam hangers designed with eyes which are not formed solid, prohibited, effective *January 1, 1903,* on all cars. From owners. *Reason:* The present situation justifies this extension. Also, see recommended modification of Rule 19.

[The effective dates for other sections of Rule 3 were extended as follows: First and second paragraphs of Section (c) to January 1, 1933; Section (d) to January 1, 1934; first and second paragraphs, Section (f) to January 1, 1934; seventh and eighth paragraphs, Section (t) to January 1, 1934; and second paragraph, Section (u) to January 1, 1934. All of these changes were recommended because of the present business situation.—EDITOR.]

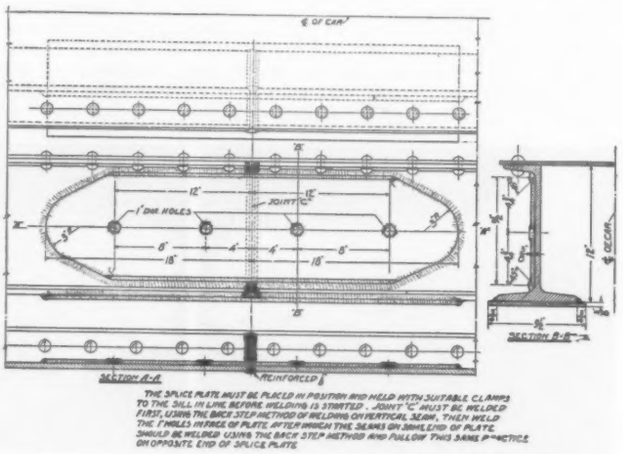

SECTION A-B
REINFORCED
THE SPLICE PLATE MUST BE PLACED IN POSITION AND HELD WITH SUITABLE CLAMPS TO THE SILL IN LINE BEFORE WELDING IS STARTED. JOINT 'C' MUST BE WELDED FIRST, USING THE BACK STEP METHOD OF WELDING ON VERTICAL SEAM. THEN WELD THE FINGERS IN FACE OF PLATE, AFTER WHICH THE SEAMS ON SIDE AND END OF PLATE SHOULD BE WELDED USING THE BACK STEP METHOD AND FOLLOW THIS SAME PRACTICE ON OPPOSITE END OF SPLICE PLATE

Fig. 13-C—A. R. A. center sill with welded splice

The committee recommends two new paragraphs to Section (d), to be included in the next supplement, to read as follows:

Proposed form—Draft gear, complying with A. R. A. Standard specifications for draft gears for freight service including certificate of approval, required on all cars built new on or after January 1, 1934. From owners.

Draft gear, new, when applied to any car on or after January 1, 1934, shall, when practicable, comply with the foregoing specifications.

Reason: As recommended by the Committee on Couplers and Draft Gears.

The committee recommends a new fourth paragraph to Section (s), to be included in the next supplement, to read as follows:

Proposed form—Stenciling: Load limit markings, as provided in Rule 30, required on all cars except tank cars and live poultry cars, effective January 1, 1933. From owners.

Reason: To comply with the intent of Rule 30.

The committee recommends that ninth paragraph of Section (t) be modified, effective August 1, 1932, as follows:

Proposed form—Tank Cars: Permanent metal holders designed to provide for secure attachment, easy application, removal, or reversal of the placards prescribed by the Interstate Commerce Commission Regulations for application to tank cars, required on all new cars, on new underframes to which tanks are applied, and to all cars receiving general repairs on or after January 1, 1932, *except cars used exclusively for the transportation of non-inflammable, non-corrosive, non-poisonous and non-dangerous commodities for which the I. C. C. Regulations do not require placards.* From owners.

Reason: An exception should properly be made in such cases, as recommended by the Committee on Tank Cars.

The committee recommends a new last paragraph to Section

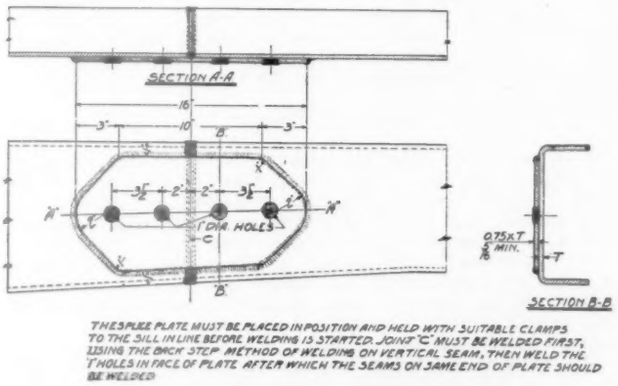

SECTION A-A
SECTION B-B
1" DIA HOLES
THE SPLICE PLATE MUST BE PLACED IN POSITION AND HELD WITH SUITABLE CLAMPS TO THE SILL IN LINE BEFORE WELDING IS STARTED. JOINT 'C' MUST BE WELDED FIRST, USING THE BACK STEP METHOD OF WELDING ON VERTICAL SEAM, THEN WELD THE 1" HOLES IN FACE OF PLATE AFTER WHICH THE SEAMS ON SAME END OF PLATE SHOULD BE WELDED

Fig. 14-A—Side sill with welded splice

(t), to be included in the next supplement, to read as follows:

Proposed form—(13) Tank cars (except those used exclusively in transporting corrosive liquids, and so stenciled) with dome covers not secured to tank by means of hinge or chain, will not be accepted after January 1, 1934. From owners.

Reason: As a safety measure, in accordance with requirements of the A. R. A. Tank Car Specifications.

Rule 4—The committee recommends that Section (b) of this rule be modified, as follows:

Proposed form—Defect cards shall not be required for any slight damage (new or old), that of itself does not require repairs. In this connection defect cards shall not be required for the following items unless damaged by *unfair usage* to the extent shown.

Reason: To establish definitely that Sections (c) to (h) inclusive are subject to provisions of Rule 32.

The committee recommends that the first paragraph of Section (g) be modified, a new second paragraph added to this section and present second paragraph relocated as new third paragraph; also, that new Section (h) be added, present Section (h) modified and relocated as new Section (i), and present Sections (i) and (j) relocated as new Sections (j) and (k) respectively, as follows:

Proposed form—(g) (1) All cars.—Metal end sill only, *when sills are out of alinement 2 in. or more, or* when straightening of same is necessary for proper operation of uncoupling

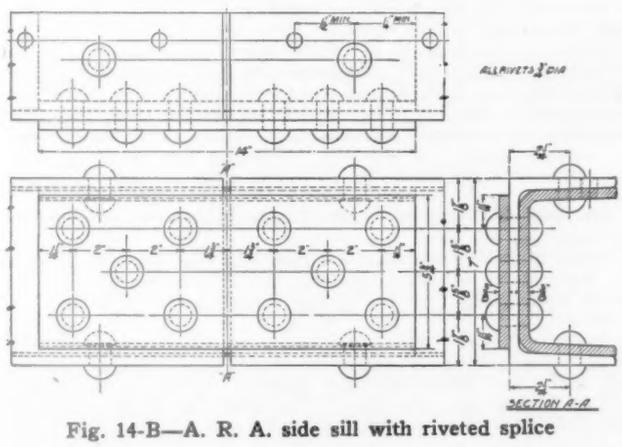


Fig. 14-B—A. R. A. side sill with riveted splice

apparatus, or dumping device, or to restore safety appliances to original alinement, or to repair cardable directly associated defective parts.

(2) All cars.—Metal side sills, extending from bolster to end sill only, if flange or web is bent in excess of 2 in.

(3) Defect card shall not be required for damaged push pole pocket when not directly associated with other delivering line defects.

(h) (1) Tank cars.—Sheets, heads or domes of non-insulated cars, when bent inwardly in excess of 8 in. by 8 in., or equivalent area, or when bent inwardly in excess of ¼ in. in depth regardless of area.

(2) Tank cars.—Metal jackets of insulated cars, when bent inwardly in excess of 8 in. by 8 in., or equivalent area, or when cut or broken through jacket.

(3) Tank cars.—Safety railings, handholds, sill steps, ladder treads, ladder stiles, and their brackets or supports, including running board supports, when bent so that safety appliances are beyond clearance limits prescribed by I. C. C. Safety Appliance Acts.

(i) At points where joint inspection is not in effect, the matter will be left to the judgment of the receiving line *or car owner.* Where chief joint interchange inspectors are employed, the decision will be made by the chief inspector.

(j)—Same as former Section (i).

(k)—Same as former Section (j).

Reason: To more clearly define the limits of responsibility for these defects on cars offered in interchange.

Rule 5—The committee recommends that the extended time limits of the second paragraph of this rule, as shown in Supplement No. 1 to the current code, be continued until January 1, 1934.

Reason: As recommended by the General Committee on account of the curtailment in car repairs resulting in the holding of bad-order cars.

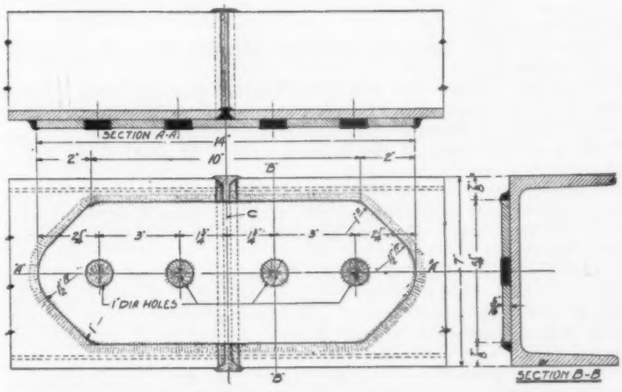

SECTION A-A
SECTION B-B
1" DIA HOLES
THE SPLICE PLATE MUST BE PLACED IN POSITION AND HELD WITH SUITABLE CLAMPS TO THE SILL IN LINE BEFORE WELDING IS STARTED. JOINT 'C' MUST BE WELDED FIRST, USING THE BACK STEP METHOD OF WELDING ON VERTICAL SEAM, THEN WELD THE 1" HOLES IN FACE OF PLATE AFTER WHICH THE SEAMS ON SAME END OF PLATE SHOULD BE WELDED USING THE BACK STEP METHOD AND FOLLOW THE SAME PRACTICE ON OPPOSITE END OF SPLICE PLATE

Fig. 14-C—A. R. A. side sill with welded splice

Rule 9—The committee recommends that the fourth requirement opposite item of "Wheels and Axles, R&R", be modified, effective August 1, 1932, as follows:

Proposed form—All markings on wheels, *including weight cast on cast-iron wheels.*—If no marks are found on same, a notation to that effect must be made. *Weight markings are to be shown in the "service metal" column.*

Rule 12—The committee recommends that the fifth paragraph of Rule 12 be modified, effective August 1, 1932, as follows:

Proposed form—Joint evidence must be obtained within 90 days after first receipt of car home and said joint evidence shall not be valid unless used within *28 months* from date of issue.

Reason: Account changes in Rules 5 and 94.

Rule 17—The committee recommends the proposed addition to the table shown in the second paragraph of Section (c), to be effective August 1, 1932, as follows:

Knuckle Applied	Knuckle Removed	Wrong Repairs	Remarks
E	E	No	None
E	D	No	None
D	D	No	None
D	E	....	Temporary repairs—no charge permitted.

The committee recommends that first paragraph of Section (e) be modified, as follows:

Proposed form—A. R. A. No. 2 or A. R. A. No. 2 plus brake beams shall be used in repairs to all freight equipment cars equipped with non-A. R. A., A. R. A. No. 1 or A. R. A. No. 2 brake beams; charges and credits to be on basis of beams applied and removed. A. R. A. No. 2 plus and A. R. A. No. 3 brake beams must be replaced in kind, *regardless of stenciling.*

Rule 18—The committee recommends that Rule 18 be modified (effective May 1, 1932, as stated in Circular DV-761), to be issued in the next supplement to the code, as follows:

Proposed form—Couplers, *types D and E, with* distance between point of knuckle and guard arm *exceeding 5-5/16 in., as measured by gage shown in Fig. A on page 42,* must have the defective part or parts renewed to bring coupler within gage, in which case owners are responsible. *However, coupler bars with cracks not exceeding 2½ in. in length in any one direction in the thin wall back of knuckle tail, shall not be removed from service for this defect. To justify bill for bringing couplers within gage, the distance between point of knuckle and guard arm must not exceed 4⅞ in., measured perpendicularly to guard arm as shown in Fig. B.*

Couplers, *other than types D and E (MCB 1904 contour), with* distance between point of knuckle and guard arm *exceeding 5⅛ in.,* measured perpendicularly to guard arm *as shown in Fig. B on page 42,* must have the defective part or parts renewed to bring coupler within gage, in which case owners are responsible.

(Note.—Fig. A will be gage approved by letter ballot this year, shown as Fig. 5 in Circular DV-761. Fig. B will be drawing now shown on page 42 of the current code of Interchange Rules.)

Reason: As recommended by the Committee on Couplers and Draft Gears and approved by letter ballot.

Rule 19—The committee recommends the addition of new item to Rule 19, to read as follows:

Proposed form—Brake beam hangers designed with eyes which are not formed solid.

Reason: The application of such hangers to foreign cars should be prohibited.

Rule 22—The committee recommends that Rule 22 be modified, as follows:

Proposed form—(1) For cars having wooden sills. *Figs. 10, 10-A, 11, 11-A, and 15.* (No change in present drawings.)

(2) For cars having steel center-sill splices located at least 7 in. from the face of the bolster. *Figs. 12 and 12-A.* (No change in present drawings.)

(3) For cars having steel center-sill splices located between the body bolster and the end sill, and less than 8 in. from the face of the bolster. *Figs. 13 and 13-A.* (No change in present drawings.)

(4) For cars having A. R. A. center-sill splices—riveted type of splice. *Fig. 13-B,* splice to be located between body bolsters at any point where construction of car will permit and dimensions of splice as shown on Fig. 13-B can be adhered to.

Should center-sill cover plate also be fractured, splice plate of same thickness and width as cover plate now on car, and of length to take at least four rivets in each sill, each side of fracture, to be applied. At each end of this plate, between sills, two rivets to be applied. All rivets to be of same size as now in cover plates.

(5) For cars having A. R. A. center-sill splicers—welded type of splice. *Fig. 13-C,* splice to be located at any point on center sill where applicable.

Should center-sill cover plate also be fractured, splice plate of same thickness and width as cover plate now on car, and of length to take at least four rivets in each sill, each side of fracture, to be applied. At each end of this plate, between sills, two rivets to be applied. All rivets to be of same size as now on car.

(6) Side-sill splices—*riveted type. Fig. 14.* (No change in present drawing.)

(7) Side-sill splices—*welded type. Fig. 14-A,* splices may be located on either side of body bolster.

(8) A. R. A. side-sill splices—riveted type. *Fig. 14-B,* splices may be located at any point between end sills where applicable.

(9) A. R. A. side-sill splices—welded type. *Fig. 14-C,* splices may be located at any point between end sills where applicable. The splice plate may be located on opposite side of web from that shown, if desired.

Reason: As recommended by the Committee on Car Construction, who approved the proposed methods after extensive tests made under its direction.

Rule 23—The committee recommends that Rule 23 be modified (effective May 1, 1932, as stated in Circular DV-761), to be issued in the next supplement to the current code of interchange Rules, as follows:

Proposed form—Section II (tenth item). Coupler knuckles, knuckle pins, locks, lifters and throwers.

Section III (fourth paragraph). Coupler bodies, knuckles, locks, lifters and throwers, *and cast-steel coupler yokes.* After building up to the original sections, the same must be dressed and then checked with proper gages to insure interchangeability and proper operation.

(Note.—The reclamation of above items must be in accordance with practice described in Circular DV-761.)

Section III (last paragraph). The building up of worn surfaces on car wheels and brake beam heads, is prohibited.

Section IV (new item). *Couplers: Welding cracks in guard arm and back wall of coupler head in accordance with practice described in Circular DV-761.*

Reason: As recommended by the Committee on Couplers and Draft Gears and approved by letter ballot.

Section IV (new item). Cast-steel and forged-steel center plates.

(Note.—Welding of rivet holes broken out, corners broken off and broken or cracked ribs also permitted. Conditions surrounding filler above body center plate should be examined and, if necessary, corrected to prevent uneven bearing.)

Reason: As recommended by the Committee on Car Construction.

Rule 32—The committee recommends that Rule 32 be modified, as follows:

Proposed form—(a) (Second sentence). The same responsibility also applies in case of *either or both ends of car body* dropping down on the rails or ground, or body turning over on side, due to failure of sills or other parts, these conditions being considered the same as derailment.

(b) Cornering; sideswiping; misplaced switches; wrong or misinterpreted signals or failure to give or to observe signals; letting cars get away on incline; or failure to properly control moving cars with car retarding device.

(c) Train collision.

(d) Impact switching: Damage to extent shown in Rule 44 will be delivering company responsibility. Damage to less extent will be owners responsibility except where caused under conditions referred to in Sections (a), (b) or (c).

[Items (1) to (7), inclusive, under Section (d) were transferred to Section (b)—EDITOR.]

(m) Storm where car is damaged *or destroyed; except roofs, running boards, or parts thereof, damaged or missing due to this cause.*

Reason: To more equitably apportion responsibility for damage. The details specified are expected to be constructed so as to withstand action of the elements.

(q) Failure to close angle cock on rear of train when cutting off pusher engine.

Reason: Damage from this cause should properly be classified as responsibility of handling company.

Eliminate reference to Section (m) on account of the revision of this section.

Rule 44—The committee recommends that Sections (4) and (5) of Rule 44 be modified, as follows:

Proposed form—(4) All-steel underframe cars having but one steel center member.—When such member is *bent in excess of 2½ in. or broken,* except where due to progressive fracture back of body bolster or failure of cast-steel extension (draft arm).

(5) All-steel underframe cars having two or more steel longitudinal sills.—When two steel center sills are *bent in excess of 2½ in.* between body bolsters *or broken between body bolsters.* When the damage is confined to the sills between the end sill and body bolster, owner will be responsible, provided after investigation it is found that car was not subjected to unfair handling as provided by Sections (a), (b), (c), (e), (f), (o) and (q) of Rule 32.

Rule 45—The committee recommends the addition of a new rule, to read as follows:

Proposed form—Rule 45. Cars shall not be accepted from owner with center sill or center sills bent between bolsters when deflection is in excess of 1½ in., unless defect card of car owner is attached to car. Such defect card is an acknowledgment of responsibility for any additional deflection due to further bending of the sills. Handling line, however, will be responsible for such sills if broken under the provisions of Rule 32.

Reason: To properly place responsibility for progressive damage to sills.

Rule 60—The committee recommends that Paragraph (d) of Rule 60 be modified, effective September 1, 1932 (at the same time changes in the billing rules become effective), as follows:

Proposed form—(d) Charge is not permissible for cleaning triple valve or cylinder unless the triple valve, cylinder, retaining valve and centrifugal dirt collector *(when so equipped)* are all cleaned at same time. *The term "air brakes cleaned, per Rule 60" shown on original record and billing repair card,*

will be accepted as evidence that all work has been properly performed.

Reason: Account of modification of Rule 111, it is unnecessary to specify these details on billing records when performed in connection with air brake cleaning.

The committee recommends that Paragraph (k) of Rule 60 be modified, effective September 1, 1932 (at the same time changes in the billing rules become effective), as follows:

Proposed form—(k) Charge for cleaning air brakes within the nine months' time limit is not permissible account renewal of defective air reservoir or cylinder gasket on detachable type equipment; however, charge for such cleaning is permissible where the combined type equipment is involved in the renewal of air reservoir or cylinder gasket.

Reason: It is considered good practice to clean the brake equipment when these parts are renewed on the combined type equipment.

Rule 61—The committee recommends that Rule 60 be modified, as follows:

Proposed form—In connection with annual repairs to air brakes, or when car is on repair track for other work, the brake levers shall be checked to assure their conformity with standard dimensions shown on metal badge plate attached to car. Wrong brake levers or wrong brake rods shall be replaced with standard to car at owner's expense. *Brake hangers, hanger pins and brackets shall also be checked in accordance with the condemning limits shown in Rule 63 and renewed or repaired if necessary.*

Rule 63—The committee recommends that fifth paragraph of this rule be modified, as follows:

Proposed form—Brake beams should be considered as requiring renewal when tension rods are cut, or are worn 5/16 in. or more below the original diameter, or when brake heads are worn so that—

(a) The vertical thickness of the top portion of top hanger eye is worn to 7/16 in. or less.

(b) Center or upper hanger openings are worn so that the opening measured vertically at hanger bearing is 1½ in. or more.

(c) Top bearing surface of lower lug is worn through or where the distance between upper and lower lugs measures 2¼ in. or more at face of head.

(d) Top or bottom toes are worn away or broken so that they do not support the shoe.

(e) Overall length of head is less than 11½ in.

Reason: As recommended by the Committee on Brakes and Brake Equipment and Committee on Car Construction.

Rule 66—The committee recommends that Section (h) of Rule 66 be modified, as follows:

Proposed form—No charge shall be made for repacking, etc., unless all boxes are repacked and the work complete, in all details, has been performed; *or if oil used does not meet the A. R. A. specifications in all details.*

Reason: It is felt this requirement should be made mandatory.

Rule 83—The committee recommends that this rule be modified, effective August 1, 1932, as follows:

Proposed form—The application of cast-iron wheels cast after June 30, 1924, of nominal weight less than 750 lb., *to axles having journals 10 in. long or over,* is prohibited. The application of cast-iron wheels (irrespective of date cast), of nominal weight less than 650 lb. *to axles having journals 8 in. long or over, or 700 lb. to axles having journals 9 in. long or over,* is prohibited.

Such wheels shall not be removed for this cause alone, but shall be scrapped regardless of condition when removed for any defect on mate wheel or axle, *and* the weight *as cast on Wheel when* shown on billing repair card will be sufficient authority for rendition of bill.

Rule 85—The committee recommends that reference in the sixth and seventh lines of Rule 85 reading "collar broken *off*" be modified to read "collar broken."

Rule 94—The committee recommends that the extended time limits of first paragraph of Rule 94 as shown in Supplement No. 1 to the current code, be continued until January 1, 1934.

Reason: As recommended by the General Committee, account curtailment of car repairs resulting in holding of bad order cars.

Rule 95—The committee recommends that first paragraph of Rule 95 be modified, as follows:

Proposed form—Labor only shall be charged against car owner for replacing the following details in kind (or by substitution of other materials), when lost on the line of the company making the repairs *and the condition of such missing details is unknown:*

Rule 98—The committee recommends that third and fourth paragraphs of Section (c) of Rule 98 be modified, effective August 1, 1932, as follows:

Proposed form—On basis of Rule 83, cast-iron wheels cast after June 30, 1924, of nominal weight less than 750 lbs., *or without nominal weight cast thereon,* shall be credited as scrap when removed from service; responsibility for same being governed by the responsibility for defective mate wheel. If mate wheel is not defective the responsibility for wheel condemned account under weight *or without cast weight* will be governed by the responsibility for defective axle on which mounted. In such case the nominal weight as cast on the wheel, *or notation "No cast weight" (if none appears on wheel),* shall be shown on billing repair card to justify scrap credit.

Also, on basis of Rule 83, cast-iron wheels, irrespective of date cast, of nominal weight less than 650 and 700 lb., *or without nominal weight cast thereon,* shall be credited as scrap (regardless of condition) when removed from service, at the expense of car owner in all cases except as provided for in Rule 68, last paragraph of Rule 81 and in cases where one wheel is broken in derailment when broken wheel will be credited as scrap at expense of handling line and mate wheel (if undamaged) will be credited as scrap at expense of car owner. *In such case the nominal weight as cast on the wheel, or notation "No cast weight" (if none appears on wheel), shall be shown on billing repair card to justify scrap credit.*

Reason: To clarify the intent and definitely provide for wheels without nominal weights cast thereon.

Rule 101—The committee recommends that table for A. R. A. trussed type brake beams (Fig. 1) shown under Rule 101 be modified, effective August 1, 1932, to read as shown:

Reason: To include additional combinations of tension and compression members, as recommended by the Committee on Car Construction and Committee on Brakes and Brake Equipment. Tables numbered for easier reference.

Rule 108—The committee recommends the addition of items to Section (a), modification of third item under Section (a), and addition of new note to last item under Section (b) of Rule 108, effective September 1, 1932 (at the same time changes in the billing rules become effective), as follows:

Proposed form—(a) (New Items). Brake connection key bolt or pin, reversed.

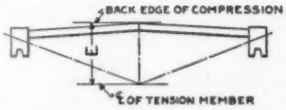
Brake shaft, entirely or partly R. & R., or renewed in connection with R. & R. or R. of end sill, end plate, or drilling hole, or cutting keyway.

Carrier iron, Bettendorf type, adjusted, when turned over.

Coupler attachments, shifting back into position.

IDENTIFICATION TABLE FOR A.R.A. TRUSSED TYPE BRAKE BEAMS

ANY BEAM WITH A SINGLE DIMENSION OR REQUIREMENT LESS THAN THAT SHOWN SHALL BE CLASSED EITHER NON A.R.A. OR ONE CLASS LOWER AS CASE MAY BE.



COMPILED BY A.R.A. BRAKE BEAM COMMITTEE 1932

MINIMUM REQUIREMENT ONLY

A.R.A. Class		No. 1	No. 2	No. 2+	No. 3
Capacity		6500	12000	15000	18000
TABLE I	A	2 1/8	2 3/8	2 3/8	2 3/8
	B	2 1/16	2 3/16	2 3/16	2 3/16
	C	7/32	1/4 5/16	1/4 5/16	1/4 5/16
	D	1"	1 1/8 1 1/4	1 1/8 1 1/4	1 1/8 1 1/4
	E	12"	13 1/2 13"	14" 14"	15 1/2 15"
TABLE II	A	2 3/8	2 7/8	2 7/8	
	B	2 1/16	2 1/2	2 1/2	
	C	5/32	3/16	3/16	
	D	1"	1 1/8 1 1/4	1 1/4	
	E	12"	13 1/2 13"	14"	
TABLE III	A	3"	3"	3"	3"
	B	1 13/16	1 13/16	1 7/8	1 13/16
	C	3/16	1/4 3/16	1/4	1/4
	D	1"	1 1/8 1 1/4	1 1/4	1 3/8
	E	12"	13 1/2 13 3/8	14"	15"
TABLE IV	A	3"	3"	3"	3"
	B	1 1/2	1 1/2	1 1/2	1 7/8
	C	3/16	7/32	1/4	1/4
	D	2 3/16 2 1/16	2 x 1/2	2 x 5/16	2 x 5/16
	E	12"	14"	14"	15"
TABLE V	A	2"	2 1/2		
	B	1 1/2	1 1/2		
	C	7/32	7/32		
	D	2 x 1/2	2 2/2 x 1/2		
	E	12"	13 1/2		

A.R.A. Class		No. 1	No. 2	No. 2+	No. 3
Capacity		6500	12000	15000	18000
TABLE VI	A		3"	3"	3"
	B		1 11/16	1 11/16	1 11/16
	C		3/8	1/2	1/2
	D		1 1/8	1 1/8 1 1/4	1 1/4
	E		14 1/16	15 1/16 14 3/4	15 1/16
	F		5/16	3/8	3/8
TABLE VII	A		2 3/4	2 3/4	3 1/2
	B		2 3/4	2 3/4	3 1/2
	C		3/16	3/16	1/2
	D		1 1/8	1 1/4	1 3/8
	E		13 1/8	15 3/8	15 3/8
TABLE VIII	A	2 1/4	2 3/4	2 3/4	3 1/2
	B	2 1/4	2 3/4	2 3/4	3 1/2
	C	1/4	3/8	3/8	1/2
	D	1 3/4	2"	2"	2 1/2
	E	14"	17"	17"	17 1/4
	F	1 3/4	2"	2"	2 1/2
	G	1/4	5/16	5/16	3/8
TABLE IX	A	2 1/8	2 1/8		
	B	2 1/8	2 1/8		
	C	1/4	9/32		
	D	1"	1 1/8		
	E	13"	15"		
TABLE X	A	2 1/2	2 1/2	2 1/2	2 1/2
	B	2 1/2	2 1/2	2 1/2	2 1/2
	C	3/16	3/16	3/16	3/16
	D	1"	1 1/8	1 1/4	1 3/8
	E	12"	13 1/2	15"	15"
	F	5/16	5/16	5/16	5/16

Table proposed for Rule 101

Journal bearing or wedge, replaced, either or both, when out of place.

Truck springs, one or cluster, or shims, replacing, when out of place, loaded or empty car.

(a) (Third Item). Bolt nuts *and rod nuts (other than body truss rods),* tightened.

(b) (Last Item). Wood screws (other than lag screws), except where six or more are applied.

Note.—This provision does not affect labor charges where other details are R. & R. or R. on screw basis.

Reason: Account of the modification of Rule 107, as recommended by the Committee on Prices for Labor and Materials.

Passenger Car Rules of Interchange

Passenger Rule 2—The committee recommends that effective dates of provisions of Section (c) and (d) of Rule 2 be extended one year, as follows:

Proposed form—(c) Effective *October 1, 1933,* cars other than passenger carrying equipment, not equipped with two-inch metallic steam heat connectors will not be accepted in interchange. Effective *January 1, 1934,* no car of passenger carrying equipment, not equipped with two-inch metallic steam heat connectors, will be accepted in interchange.

(d) Effective *January 1, 1934,* where cars are equipped with platform safety chains, same shall be located as follows: When facing end of car, the chain fitted with hook shall be on the left-hand side, and the chain fitted with eye on the right side.

Passenger Rule 7—The committee recommends that Section (h) of rule 7 be modified (effective May 1, 1932, to harmonize with Freight Rule 18 as stated in Circular D. V.—761), to be issued in the next supplement to the current code of interchange rules, as follows:

Proposed form—(h) Couplers, *types D and E, with* distance between point of knuckle and guard arm *exceeding 5 5/16 in., as measured by gage shown in Fig. A of Freight Rule 18,* must have the defective part or parts renewed to bring coupler within gage. *However, coupler bars with cracks not exceeding 2 1/2 in. in length in any one direction in the thin wall back of knuckle tail, shall not be removed from service for this defect. To justify bill for bringing couplers within gage, the distance between point of knuckle and guard arm must not exceed 4 7/8 in., measured perpendicularly to guard arm as shown in Fig. B of Freight Rule 18.*

Couplers, *other than types D and E (MCB 1904 contour), with* distance between point of knuckle and guard arm *exceeding 5⅛ in.,* measured perpendicularly to guard arm *as shown in Fig. B of Freight Rule 18,* must have the defective part or parts renewed to bring coupler within gage.

Reason: As recommended by the Committee on Couplers and Draft Gears and approved by letter ballot.

Passenger Rule 13—The committee recommends the addition of new items to Rule 13, and modification of various items, effective September 1, 1932, as follows:

Proposed form—(Section (a)—New Items). Brake connection key bolt or pin, reversed.

Carrier iron, Bettendorf type, adjusted, when turned over.

Connector between handle section of release lever and knuckle lock lifter, J., S., Carmer or similar types, removed, repaired and replaced.

Coupler attachments, shifting back into position.

Journal bearing or wedge, replaced, either or both, when out of place.

(Section (a)—Third Item). Bolt nuts *and rod nuts (other than body truss rods),* tightened.

(Section (b)—New Item). Nuts, nut locks and lock nuts (including unit nuts), all types, 1⅛ in. or smaller.

Note.—This provision has no bearing on the fact that the average weight of bolts shown in table under Rule 101 includes one nut; nor does it affect labor charges where other details are R. & R. or R. on bolt or nut basis.

(Section (b)—Last Item). Wood screws (other than lag screws), except where six or more are applied.

Note.—This provision does not affect labor charges where other details are R. & R. or R. on screw basis.

Reason: To harmonize with Freight Rule 108.

The report is signed by T. W. Demarest (chairman), general superintendent motive power, Pennsylvania; L. Richardson, chief mechanical officer, Boston & Maine; W. H. Flynn, general superintendent motive power and rolling stock, New York Central; G. E. Smart, chief of car equipment, Canadian National; J. J. Hennessey, assistant superintendent car department, Chicago, Milwaukee, St. Paul & Pacific; C. T. Ripley, chief mechanical engineer, Atchison, Topeka & Santa Fe; G. F. Laughlin, general superintendent, Armour Car Lines, and Thos. Beaghen, Jr., superintendent car maintenance, Mexican Petroleum Corporation.

Action.—The report of the committee was accepted.

Brakes and Brake Equipment

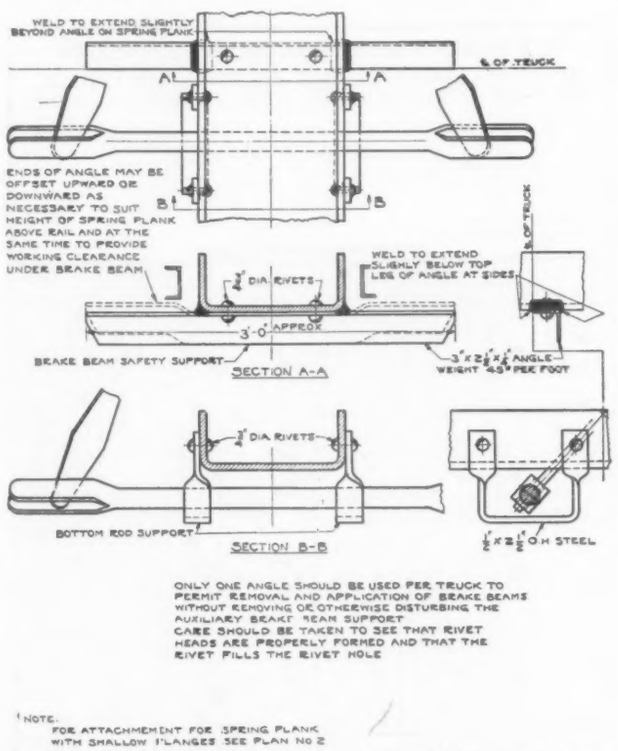
For your consideration, the Committee on Brakes and Brake Equipment submit the following report:

Safety Support for Four-Wheel Freight Car Trucks

The subject under the title "Bottom-Rod and Brake-Beam Safety Support" was submitted at the 1930 meeting following discussion at various meetings several years prior to that time. While the difficulties attendant upon brake beams dropping on the track due to the failure of brake hangers, may be minimized somewhat by better design, and the application and maintenance of brake-beam hangers and pins, it is considered necessary to provide as rapidly as practicable on all freight cars used in interchange service, an efficient and economical safety support for bottom rods and brake beams.

In our report for 1930 we submitted a tentative design of bottom-rod support with which was included a supporting member to prevent the brake beam dropping on the track in case of brake-hanger failure. As the result of action taken on the floor of the convention, the matter was referred to the Car-Construction Committee for advice on strength requirements. A complete study of the entire matter has since been made by that committee. Full information, together with dimensioned drawings covering four plans, have been submitted to the Brake Committee, and in connection therewith we submit for your consideration, the following:

1—Substitute for the sketch and text now given on page three, Section E, of the Manual, the four dimensioned


WELD TO EXTEND SLIGHTLY BEYOND ANGLE ON SPRING PLANK
℄ OF TRUCK
A1
A
ENDS OF ANGLE MAY BE OFFSET UPWARD OR DOWNWARD AS NECESSARY TO SUIT HEIGHT OF SPRING PLANK ABOVE RAIL AND AT THE SAME TIME TO PROVIDE WORKING CLEARANCE UNDER BRAKE BEAM
B1
B
℄ OF TRUCK
¾" DIA. RIVETS
WELD TO EXTEND SLIGHTLY BELOW TOP LEG OF ANGLE AT SIDES
3'-0" APPROX
BRAKE BEAM SAFETY SUPPORT
SECTION A-A
3" X 2½" X ¼" ANGLE WEIGHT 4.9 PER FOOT
¾" DIA. RIVETS
BOTTOM ROD SUPPORT
SECTION B-B
½" X 2½" O.H. STEEL
ONLY ONE ANGLE SHOULD BE USED PER TRUCK TO PERMIT REMOVAL AND APPLICATION OF BRAKE BEAMS WITHOUT REMOVING OR OTHERWISE DISTURBING THE AUXILIARY BRAKE BEAM SUPPORT
CARE SHOULD BE TAKEN TO SEE THAT RIVET HEADS ARE PROPERLY FORMED AND THAT THE RIVET FILLS THE RIVET HOLE
NOTE.
FOR ATTACHMENT FOR SPRING PLANK WITH SHALLOW FLANGES SEE PLAN NO 2

Plan No. 1 submitted by the Brake Committee for bottom-rod and brake-beam safety supports for four-wheel freight-car trucks

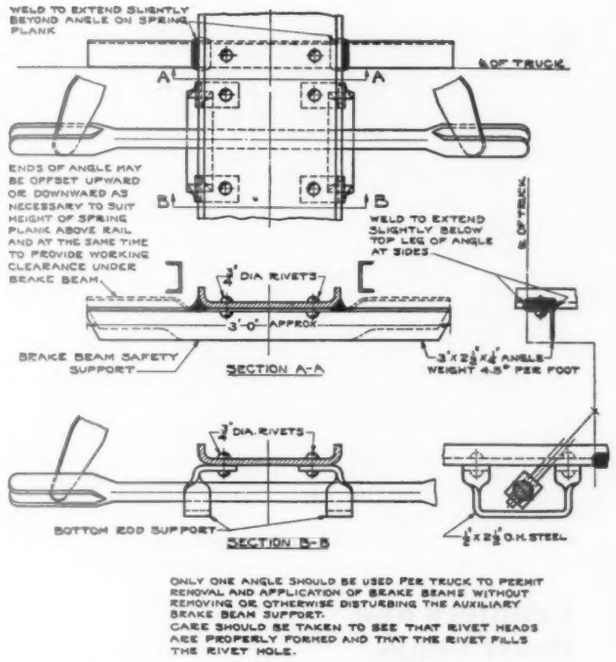
sketches illustrating designs and application of the non-patented supports, designated as Plan 1, 2, 3 and 4.

2—Change the title in the Manual from "Bottom-Rod Support" to "Bottom-Rod and Brake-Beam Safety Support for Four-Wheel Freight-Car trucks."

3—Include a paragraph in the Manual as follows:

"Four-wheel freight-car trucks having inside hung brakes may be equipped with bottom-rod and brake-beam safety supports of design other than that shown on the accompanying drawings, provided they are equivalent in strength requirements and accessibility for application and renewal of brake beams."

There are in service many brake beam safety supports different in design from the non-patented devices we are now recommending, such as Creco three- and four-point supports,

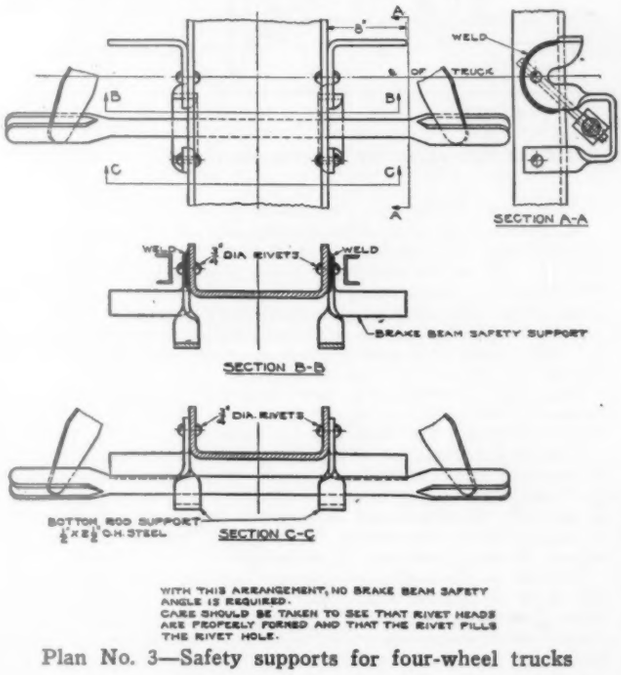

WELD TO EXTEND SLIGHTLY BEYOND ANGLE ON SPRING PLANK
℄ OF TRUCK
ENDS OF ANGLE MAY BE OFFSET UPWARD OR DOWNWARD AS NECESSARY TO SUIT HEIGHT OF SPRING PLANK ABOVE RAIL AND AT THE SAME TIME TO PROVIDE WORKING CLEARANCE UNDER BRAKE BEAM.
WELD TO EXTEND SLIGHTLY BELOW TOP LEG OF ANGLE AT SIDES
DIA RIVETS
3'-0" APPROX.
BRAKE BEAM SAFETY SUPPORT
SECTION A-A
WEIGHT 4.5# PER FOOT
BOTTOM ROD SUPPORT
SECTION B-B
O.H. STEEL
ONLY ONE ANGLE SHOULD BE USED PER TRUCK TO PERMIT REMOVAL AND APPLICATION OF BRAKE BEAMS WITHOUT REMOVING OR OTHERWISE DISTURBING THE AUXILIARY BRAKE BEAM SUPPORT.
CARE SHOULD BE TAKEN TO SEE THAT RIVET HEADS ARE PROPERLY FORMED AND THAT THE RIVET FILLS THE RIVET HOLE.
NOTE:
THIS FORM OF ATTACHMENT FOR BOTTOM ROD SUPPORT IS PROVIDED FOR USE WHERE HEIGHT OF SPRING PLANK FLANGES DOES NOT PERMIT APPLICATION SHOWN ON PLAN No. 1

Bottom-rod and brake-beam safety supports—Plan No. 2 for four-wheel freight-car trucks

Buffalo supports, Creco Economy safety guards, etc., which we believe will meet all the requirements; hence our recommendation with reference to devices of this character in item three. Our present proposal is to make compulsory, the application of such designs as we have found to be the cheapest arrangement that will afford desired protection and at the same time provide for a choice of individual carriers.

We recommend submitting to letter ballot for adoption as standard practice, items one and three.

If the foregoing is adopted, we would also recommend, subject to the approval of the Arbitration Committee, the adoption of a new section to interchange Rule 3, to read substantially as follows: "On and after March 1, 1933, all new cars shall be equipped with brake-beam and bottom-rod safety supports to conform to these recommendations," and that consideration be given to the following for existing cars: "After a date to be determined by the Arbitration Committee no car will be accepted from owner unless equipped with suitable bottom-rod and brake-beam safety supports."


WELD
℄ OF TRUCK
SECTION A-A
DIA RIVETS
BRAKE BEAM SAFETY SUPPORT
SECTION B-B
BOTTOM ROD SUPPORT
O.H. STEEL
SECTION C-C
WITH THIS ARRANGEMENT, NO BRAKE BEAM SAFETY ANGLE IS REQUIRED.
CARE SHOULD BE TAKEN TO SEE THAT RIVET HEADS ARE PROPERLY FORMED AND THAT THE RIVET FILLS THE RIVET HOLE.

Plan No. 3—Safety supports for four-wheel trucks

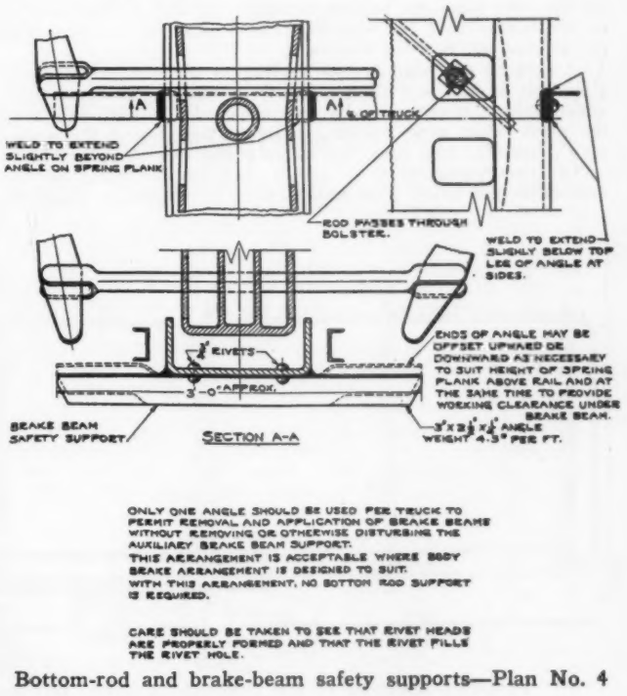
Air-Brake Piping

In connection with the failure of air-brake piping on freight cars and normal leakage from the brake system, your committee has thoroughly investigated the matter of pipe fittings for freight and passenger equipment. We are of the opinion that it would be wise and profitable for the railways to standardize on both quality and dimensions for all air-pressure work on cars, and accordingly submit the following as recommended practice: "Pipe fittings for freight- and passenger-car air piping shall be extra heavy and in accordance with the dimensions and material requirements as to manufacture and tests for similar fittings adopted by the A. R. A. last year for locomotive use, except where special connections are used to specialty devices. Where practicable and convenient, flange connections of the type furnished by the air-brake manufacturers should be used at brake-cylinder, reservoir and pipe-bracket connections."

Our reasons for recommending these heavy duty fittings for air piping on cars are:

(a) That there is very little difference in the cost of these fittings compared with the standard commercial or the special air brake fittings now employed.

(b) That it would materially improve the conditions on car equipment where such heavy duty fittings are used.


WELD TO EXTEND SLIGHTLY BEYOND ANGLE ON SPRING PLANK
℄ OF TRUCK
ROD PASSES THROUGH BOLSTER.
WELD TO EXTEND SLIGHTLY BELOW TOP LEG OF ANGLE AT SIDES.
RIVETS
3'-0" APPROX.
ENDS OF ANGLE MAY BE OFFSET UPWARD OR DOWNWARD AS NECESSARY TO SUIT HEIGHT OF SPRING PLANK ABOVE RAIL AND AT THE SAME TIME TO PROVIDE WORKING CLEARANCE UNDER BRAKE BEAM.
BRAKE BEAM SAFETY SUPPORT
SECTION A-A
WEIGHT 4.5# PER FT.
ONLY ONE ANGLE SHOULD BE USED PER TRUCK TO PERMIT REMOVAL AND APPLICATION OF BRAKE BEAMS WITHOUT REMOVING OR OTHERWISE DISTURBING THE AUXILIARY BRAKE BEAM SUPPORT.
THIS ARRANGEMENT IS ACCEPTABLE WHERE BODY BRACE ARRANGEMENT IS DESIGNED TO SUIT.
WITH THIS ARRANGEMENT, NO BOTTOM ROD SUPPORT IS REQUIRED.
CARE SHOULD BE TAKEN TO SEE THAT RIVET HEADS ARE PROPERLY FORMED AND THAT THE RIVET FILLS THE RIVET HOLE.

Bottom-rod and brake-beam safety supports—Plan No. 4

(c) That it will reduce the variety of fittings to be carried in stock by the railroad stores inasmuch as they now carry various qualities or weights of such fittings.

(d) That it will remove the possibility of light and undesirable fittings being used on locomotives.

Emergency Valve and Car-Discharge Valve Attachments on Observation Platforms

From time to time confusion among trainmen has resulted in opening the conductor's valve on observation-platform cars when it was desired to use the signal valve, particularly in signaling for the engineman to shut-off the steam-heat pressure when approaching terminals. In such cases undesired emergency stops of trains have occurred. Usually the conductor's valve and signal car-discharge valve are located under the hood above the rear window on each side of the platform, such valves being equipped with short cords attached to brackets which hold them in a horizontal position close up under the hood. This requires that inspectors and others climb on the platform to operate the car-discharge valve when making the usual air-brake tests at terminals, thus inconveniencing passengers who occupy the observation platform.

To avoid confusion among trainmen and the necessity for

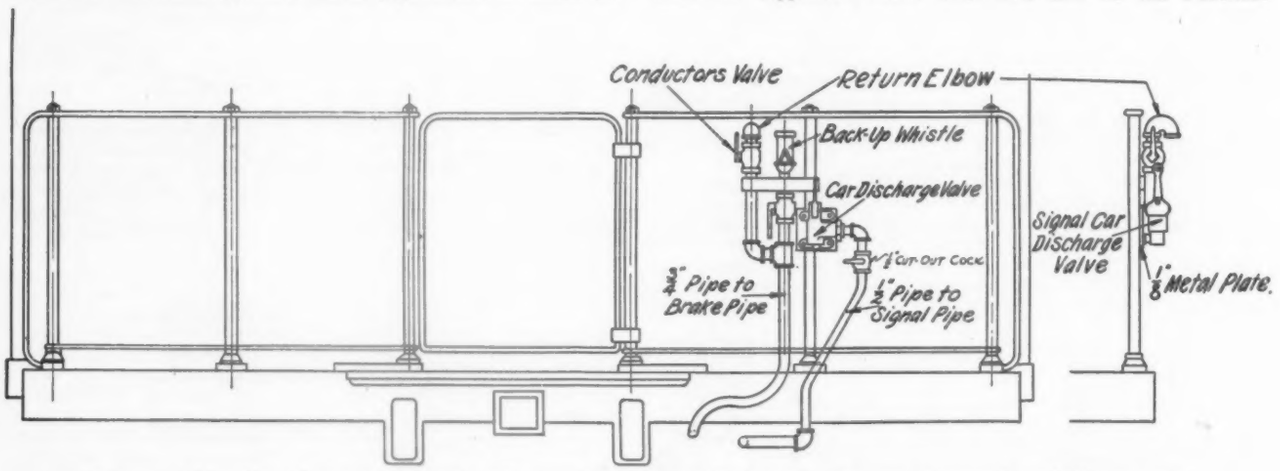
inspectors mounting the platform to operate these devices, the Pullman Company, in conjunction with a member railroad, has for several years had all its passenger cars having observation platforms, equipped with a car-discharge valve and conductor's valve located upon the end railing as shown in one of the drawings. This arrangement also provides a satisfactory back-up valve equipment, as the conductor's valve is used for a back-up valve, being equipped with an alarm whistle and adjacent thereto the car-discharge valve for signaling to the locomotive when necessary. The car discharge valve is easily reached from the car platform or from the ground. Cars equipped in this manner do not require a car-discharge valve or conductor's valve located under the hood, nor any cords or attachments leading to such devices located inside the car.

It is the opinion of your committee that the back-up device and the necessary signaling devices can very well be assembled in one unit on the platform railing, thereby eliminating the necessity for the additional devices under the hood, and which will eliminate cords. It seems impossible to maintain a distinctive color that trainmen might readily identify the signal valve from the conductor's valve. We would, therefore, recommend submitting to letter ballot as recommended practice, the following: "Remove from the observation platform of all private or business cars, parlor cars and other cars having observation platforms, the conductor's valve and signal car discharge valve located over the window under the hood, and also cords or other attachments accessible from the observation platform attached to such valves inside the car.

"Locate the conductor's valve and signal car discharge valve on the rear platform railing as shown in Fig. 1, the latter to be so located that the operating lever may be reached from the ground or from the platform.

"Attach to the branch pipe leading to the conductor's valve a suitable branch pipe equipped with operating valve and signal whistle, the conductor's valve to consist of a branch pipe from the main brake pipe reaching close to the top of the railing with a suitable stop cock for opening and closing same.

"On cars equipped with sliding coupler carriers, the connection to the brake pipe and signal pipe should be made far enough forward so that the branch pipe connects to a rigid section of the brake pipe and signal pipe."



Proposed location of the conductor's valve and signal car-discharge valve on observation-platform cars

Revision of Test Code for Triple Valves

As a result of the change in graduating springs from the old piece No. 1057 to piece No. 18286 for freight triple valves, it is desirable to change the figure "4," third line from the bottom of page 53, Section E, of the Manual of Standard and Recommended Practices, to the figure "5."

We recommend the above change which will make this line read: "position No. 5 for H-1, K-2, (H-2, with 3/16 in. service ports)."

Building Up of Worn Surfaces on Brake Beam Heads

A number of member railroads have requested that interchange Rule 23 be modified to permit the building up of worn surfaces on brake beam heads by welding.

Your committee is of the opinion that work of this character should not be permitted on malleable-iron brake heads, and since there are very few steel brake heads in service at the present time, we would recommend that there be no change made in the present rule with respect to welding of brake heads.

The report was signed by G. H. Wood (chairman), supervisor of air brakes, Atchison, Topeka & Santa Fe; T. L. Burton, air brake engineer, New York Central; B. P. Flory, superintendent motive power, New York, Ontario & Western; R. C. Burns, assistant engineer, Pennsylvania; W. J. O'Neill, general mechanical superintendent, Denver & Rio Grande Western; W. H. Clegg, chief inspector, air brake and car heating equipment, Canadian National; Mark Purcell, general air brake inspector, Northern Pacific; R. B. Rasbridge, superintendent car department, Reading; G. E. Terwilliger, supervisor of auxiliary equipment, New York, New Haven & Hartford; M. A. Kinney, general master mechanic, Chesapeake & Ohio, and H. A. Clark, general air brake inspector, M., St. P. & S. Ste. M.

Discussion.—In the discussion of this report considerable emphasis was placed on the question of clearances for foundation-brake rigging. A motion was made to request the committee to give further study to this feature of car design and recommend minimum clearances. Some misunderstanding was evident regarding where these clearances should be measured. The motion also requested the committee to develop a design of foundation brake gear which would permit the bottom connection rod to pass through the bolster of new equipment and give greatly increased clearance. After some discussion this motion was withdrawn.

Action.—The report was adopted and submitted to letter ballot.

Couplers and Draft Gears

With the co-operation of the authorities at Purdue University the sub-committee succeeded in reducing the original estimate for testing draft gears from $2,000 to $1,100 with the further stipulation that only $1,000 need be deposited for each additional type of gear tested.

Draft Gear Dimensions.—Paragraph 3 (a) of the Specifications for Approved Draft Gear and also of the Purchase Specifications have been changed to read as follows:

"3. *Dimensions*—(a) The outside measurements of the gear with the necessary followers shall be 9 1/32-in. by 12¾-in. by 24⅝-in. The width and depth given are maximum dimensions. The length is a minimum dimension which the follower and gear, when fully released, should slightly exceed."

Separate Followers—It is recommended that specifications for draft gear followers shown on page 61, Sec. C, of the Manual be revised to read as follows:

"Separate followers to be used with friction draft gears shall be made from carbon steel and conform to the A. R. A. Recommended Practice Specifications for Carbon Steel Blooms, Billets and Slabs for Forgings, Class D, as shown on pages 239 to 241, inclusive, Section A of the Manual. The size of the followers shall be 12½ in. plus or minus ⅛ in. x 8⅞ in. plus or minus ⅛ in. x 2¼ in. plus or minus 1/32 in. Edges of followers shall be formed in such a manner that they will be free from cutting edges. Shearing will not be permitted."

The above does not change the material from which these followers are to be made, but it does serve to eliminate the physical test requirement which has given some trouble and is not considered necessary. In addition it will allow the use of any process of forming that will produce satisfactory edges.

Proposed Road Tests—Proposed road tests to determine the effect of draft gear recoil and also to investigate Duryea and Alma cushion underframes and selective travel draft gears have been deferred in the interests of economy.

Elimination of Cross Key from Swivel Butt Coupler:—At the last annual meeting the question was raised whether an alternate standard could not be adopted eliminating the cross key and using a solid vertical pin as a connection between the swivel-butt coupler and the vertical cast-steel yoke. The question was submitted to this committee and consideration was also given by the Technical Committee of Draft-Gear Manufacturers and the Car-Construction Committee. The Technical Committee apparently did not favor the elimination of the cross key and cited its advantages. The Coupler and Draft-Gear Committee did not recommend the use of the swivel butt coupler without the cross key. The Car-Construction Committee on the other hand rendered an opinion to the effect that an alternate design in which the horizontal key is omitted, would be desirable. It was the consensus of opinion of the Car-Construction Committee that the key is not essential, based upon the experience had with the swivel-shank coupler used on passenger cars for many years. Recommendations were made that the matter be referred back to the Coupler and Draft-Gear Committee for definite settlement. The committee will continue to collaborate with the Car-Construction Committee with the view of arriving at a satisfactory conclusion.

Striking Casting with Separate Carrier—At the last annual meeting it was recommended, during discussion, that an alternate design of striking casting with separate carrier be prepared. This has been done and will be included in the drawings covering the proposed A. R. A. steel sheathed box car submitted by the Committee on Car Construction.

Reclamation of Couplers, Knuckles and Locks—The sub-committee given the assignment to study the practicability of extending the condemning limits for Types D and E couplers, also to consider coupler reclamation, has made its report since the last meeting of the association. The report was submitted to letter ballot and the recommendations adopted as of May 1, 1932.

The sub-committee was also assigned the study of two special types of knuckles recommended by one of the coupler manufacturers. One of these knuckles has been identified as a repair knuckle and the other as a compensating knuckle. A program of service tests was inaugurated by the committee for the purpose of determining the relative value of the different methods of reclaiming coupler knuckles. The test program also included observation of repair and compensating Type-D knuckles versus standard Type-D knuckles. The adoption by the Association of the committee's recommendations on knuckle reclaiming processes made is unnecessary to proceed further with the knuckle reclamation test and automatically continued further consideration of the special repair knuckle. The compensating knuckle, however, covers features that warrant further consideration.

At a joint meeting of the sub-committee and the coupler manufacturer's sub-committee in Cleveland, Ohio, March 31, it was decided in view of the adoption of the Type-E coupler it would not be necessary to continue the study of the Type-D compensating knuckle as applied to D bars, but it would be worth while to make this study with reference to Type-E compensating knuckles in Type-E bars; this study to be made jointly by the sub-committees of the coupler committee and the coupler manufacturers committee. In consideration of some rather encouraging figures developed by one road making a study of the compensating Type-D knuckle it was decided that in cases where Type-D compensating knuckles have already been applied and initial dimensions taken, observations might be continued of such knuckles, but it is not recommended that additional installations be made.

At this meeting the coupler manufacturers introduced some suggestions as to a change in the contour line of Type-E couplers which are intended to improve the operation and service of the couplers of this new design. A program of tests was outlined.

Coupler Yokes

Numerous questions have been raised in connection with the application of wrought-iron riveted coupler yokes shown on page 38, Section C of the manual in place of cast-steel keyed or lock yokes in repairs to foreign cars in interchange. In the opinion of your committee the wrought-iron riveted yoke shown in Section C of the manual is an obsolete type of construction and its substitution for cast steel yokes should not be permitted. The secretary has therefore been instructed, in the next revision of the manual, to add a note to the cut shown on page 38, Section C, reading as follows: "For repairs in kind only where standard to existing cars."

The secretary has also been directed to show in Section C of the manual the keyed yokes now shown on page 308, Section A of the manual, adopted as standard last year with different designs of coupler butts.

It is also recommended that the Specifications for Coupler Yokes, now recommended practice, shown on page 307, Section A of the manual, be advanced to standard.

It is further the opinion of the committee that, when A. R. A. standard keyed yokes can be used in replacement of non-standard or riveted yoke this should not constitute improper repairs.

It is recommended that the Arbitration Committee prepare the necessary changes in the interchange rules and interpretations thereof to make the foregoing effective and set up proper charges and credits.

Recommendations—That the proposed revision of specifications for Separate Draft-Gear Followers be referred to letter ballot.

That the specifications for Coupler Yokes shown on page 307, Section A of the manual be advanced to standard.

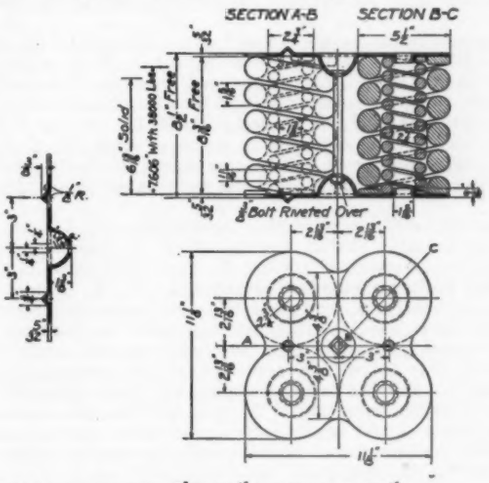
The report was signed by R. L. Kleine, (chairman) assistant chief motive power, Pennsylvania; C. P. Van Gundy, engineer of tests, Baltimore & Ohio; C. J. Scudder, superintendent motive power and equipment, Delaware, Lackawanna & Western; H. W. Coddington, engineer of tests, Norfolk & Western; C. B. Young, general mehanical engineer, Chicago, Burlington & Quincy; S. Lynn, superintendent rolling stock, Pittsburgh & Lake Erie; L. P. Michael, chief mechanical engineer, Chicago & North Western and C. T. Ripley, chief mechanical engineer, Atchison, Topeka & Santa Fe.

Action.—The report was accepted and submitted to letter ballot.

Report on Car Construction

The report for last year stated that a number of questions had been raised regarding information submitted by certain roads in reply to the Engineering Division questionnaire on maximum outline to which cars having enlarged dimensions could be operated in general interchange and consequently that a recheck of the entire matter was found necessary. Owing to present conditions, a further study of this matter is held in abeyance.

A change in the situation with respect to the question of car design has taken place since the last meeting. Shortly thereafter a definite program was formulated for the production of a new design of steel-sheathed, wood-lined box car for general interchange service. In the report for this year drawings showing the complete design, together with a specification and descriptive analysis of the work, were submitted. The committee emphasized that roads finding it necessary or desirable



Eight Bars. Four Bars 1⅛" Dia. 68½" Long. Tapered To 7½". Four Bars 1" Dia. 64½" Long. Tapered To 6⅞".
Normal Wt. of Each 1st Four Bars 26 Lbs. 6 Oz. Minimum 25 Lbs. 11 Oz.
Normal Wt. of Each 2nd Four Bars 6 Lbs. 13 Oz. Minimum 6 Lbs. 10 Oz.
Outside Diam. of Outer Coils 5½". Inner Coil 2½".
Heights: Outer Coils 8⅛" Free - 6⅛" Solid - At 7.606" Load - 7141 Lbs. Cap'y. Solid - 16900 Lbs.
Heights: Inner Coils 8⅛" Free - 6⅛" Solid - At 7.606" Load - 2359 Lbs. Cap'y. Solid - 5583 Lbs.
Cluster of Springs - Total Normal Wt. Cluster Complete Including Plates & Bolt 142 Lbs.
Cluster of Springs - At 7.606" Load - 38000 Lbs. Cap'y. Solid - 89932 Lbs.

Spring D used with A.R.A.—D5½-in. by 10-in. axle

to provide box cars of larger dimensions for restricted use may follow substantially the base design as shown at some saving in weight as compared with previous constructions of this general type. In view of the changed situation, the committee suggested that the outcome of the operating clearance check need not interfere for some time to come with freight-car standardization work, provided the new design of box car and the program under which it was produced are accepted.

Recommended-Practice Cars.—The committee reported that there have been no further developments on the single-sheathed, double-sheathed and composite auto car designs since last year, as the matter of increased clearance outline is still undecided and as the newly proposed steel-sheathed wood-lined design may influence the present single-sheathed, as well as the double-sheathed, composite box and automobile car.

Center-Plate Height.—In the report for 1931 the committee stated that, although it is entirely practicable from mechanical and operating standpoints to design trucks of 40-, 50- and 70-ton nominal capacities having a center plate height of 1¼ in. less than the present standard, no reduction therein appeared advisable.

When formulating the program for the new steel-sheathed, wood-lined box car it was decided that in order to obtain the best results the design should be considered as a whole and that in the event any existing A.R.A. design standards, except wheels, axles and related parts, were found to have an adverse effect, they would not be used. It has been determined that a center plate height of 25¾ in. would best meet the requirements when using either 40- or 50-ton trucks, and this dimension has been incorporated in the new design.

Letter Ballot Items

It was recommended that the following items be submitted to letter ballot of the members:

Truck Springs.—As a result of considerable development work undertaken during the past two or three years, experimental designs of truck springs have been placed under 50- and 70-ton cars with the idea of providing springs of conventional design, but having considerably more capacity than the A.R.A. standard designs. These springs make available conventional designs of coil springs of sufficient capacities to meet present-day maximum loading and service conditions. In 1930 the sub-committee on truck springs was instructed to produce designs of plain carbon-steel helical spring manufactured to meet A.R.A. material specifications, to meet present-day requirements, and to interchange in the space occupied by the A.R.A. spring groups, also to incorporate necessary improvements in spring-plate design. The sub-committee has prepared and submitted with this year's report such designs for the 40-, 50- and 70-ton trucks. For convenience, present designations C, D and H, respectively, have been used. Included in the report are drawings of the proposed spring designs, together with a statement of comparative design and capacity characteristics. The solid capacities are, respectively, 77,760 lb., 89,932 lb., and 112,415 lb.

[The illustration shows the D spring recommended by the committee. The C spring, for use with 5-in. by 9-in. axles, is similar, except that inner coils are omitted from two diagonally opposite outer coils, the total weight of the cluster complete being 129 lb., the load at 7.597 in. being 33,800 lb. and the solid capacity, 78,776 lb. The spring H is arranged with five double coils, one in the center, and weighs completed 178 lb. At 7.606 in. height the load is 47,500 lb. and the solid capacity is 112,415 lb.—EDITOR.]

The committee recommended that new designs C, D and H be submitted to letter ballot for adoption as recommended practice for use in place of springs C, D and H now in the Manual; that tentative standard designs L, M, N, O and P be withdrawn therefrom, and that the Committee on Specifications and Tests for Materials be instructed to work up a complete processing specification for coil springs and assembled nests, this to include approved manufacturing practices relating to the bar steel, temperature, heat treatment, winding and similar operations. It also includes fabrication into the finished coil and finally into the complete spring nest, with necessary instructions to be followed in properly inspecting and accepting the springs.

The sub-committee's assignment also included a spring to be designed for the 100,000-lb. capacity truck, but due to the limited number of trucks now in service and the lack of information thereon, the study will be continued and an effort made to present drawings and specifications next year.

Journal Boxes and Lids.—Objections were raised by manufacturers to the 1930 recommendations of the committee to the small beveled ledge along the top edge of the journal box. The report included a sketch showing a flat top surface 3/8-in. wide adjacent to the front edge of the box with a recess provided in the front face of the hinge lug for the top lip projection as specified in the standard lid specifications. The sketch also showed a drain depression in the top of separately cast journal boxes to assist in preventing dirt or foreign matter being washed into boxes of this design. The changes shown in the sketch are recommended as standard practice for journal boxes C, D, E and F. Further recommendations for changes in the journal-box-lid specifications are as follows:

Paragraph 1, Scope. Change to read as follows: "This specification covers all lids for use on A.R.A. standard journal boxes C, D, E and F."

Paragraph 2, Material. Change the last sentence to read: "When made of pressed steel, thickness to be not less than 5/32 in., and material to have a carbon content between 0.10 per cent and 0.20 per cent."

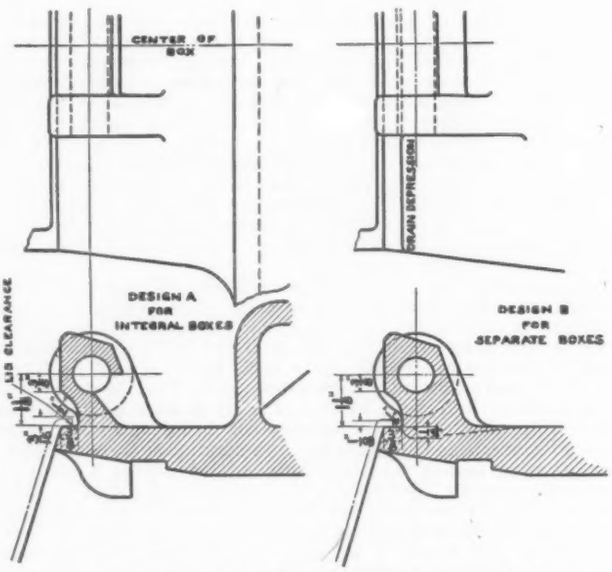
The present specifications call for a continuous lip projecting at least ¼ in. across top of the lid. Most journal boxes in service have insufficient clearance at the hinge lug for this lip and, to avoid interference until the journal boxes properly recessed at the hinge lug are in general use, we recommend the following be added at the end of Paragraph 4 (h): "Unless otherwise specified, all lids to be furnished with central portion of top lip cut away to provide clearance at the hinge lug for application in repairs."

Revise Paragraph 4 (j) to read as follows: "The eyes of cast lids must be integrally closed their full length.

"Pressed-steel lids which, when in place on the journal box, have no attachment to the hinge pin other than the eyes formed on the lid, shall have such eyes gaged to insure a tight lid fit and welded their full length or secured by not less than two 3/8-in. rivets.

"Lids having their main connection with the pin through the hood shall have the pin holes gaged to insure a tight lid fit, and where there is no strain on the eyes formed on the lid, except the small amount during the act of opening or closing, neither of which is sufficient to distort the eyes, shall have the eyes scrolled neatly and contacting with adjacent metal.

"The pin holes and pin eyes must be parallel with the contact face."



Drain depression and lid clearance for journal boxes C, D, E and F

Minimum Dimensions for Journal-Bearing Backs.—After an examination of hundreds of journal bearings returned to foundries by various railroads for relining, it was felt that a practical and economical limit through the crown for relining should be fixed at 1/16 in. below nominal thickness. All other dimensions of the back (except the wear at the ends from contact with the journal fillet and journal collar) are fixed at ⅛ in. under or over the nominal dimensions, as experience has shown that this wear of ⅛ in. plus the additional wear encountered in further service during the life of a relined bearing, is the maximum that should be allowed and still maintain proper conditions between the bearing and all of the other truck parts.

The sub-committee submitted recommended specifications for the relining of journal-bearing backs together with minimum dimensions to be used in connection with such bearings.

Recommended Change in Manual.—It is recommended that the heading for the table shown on page 24-A, Section D, of the Manual, covering recommended practice minimum dimensions for journal bearings, be changed to read: "Filled journal bearings, minimum thickness for backs of", in order to distinguish it from the table for minimum dimensions and for backs of *lined* journal bearings recommended in the report.

Recommended Changes in Interchange Rules.—In addition to the above, the committee also recommended that Interchange Rule 11 be abrogated, because of the impracticability of determining the thickness of the lining and consequent inability of car repairer to state whether filled or solid bearing, and that an addition be made to Interchange Rule 19 prohibiting the application to foreign cars under any circumstances of a journal bearing having back with dimensions below the minimum or above the maximum limits specified for relining. While it is true that the car repairer would be unable to determine thickness of the back, it is felt that this restriction should be set forth as a guide in the purchase of new bearings or relining of old backs for use in foreign cars.

With these amendments to the Interchange Code, Rule 66, Section (j), would remain as the guide for the removal of journal bearings from service, and it is believed that this section (j) should be amended more clearly to indicate the causes which will be considered as sufficient for withdrawal from service.

Designating Letters for Cars.—During the past year, recommendations have been received relating to a change in the definition of the BH—horse or horse and carriage express car—and request has been made for a new designating symbol and a definition to cover the Dry Ice refrigerator car. The recommended changes are as follows:

BH—Horse or horse and carriage express. A car constructed and equipped to render it suitable for passenger-train service for the transportation of fine stock, with or without stalls (movable or stationary), and with or without space left for carriage or horse equipment.

Class R—Refrigerator Car Type. RC—Dry Ice Refrigerator.—A heavily insulated house car, without ventilation, and with cross partitions forming compartments provided with doors either in the partitions or car sides. For transportation of dry ice (solid carbon dioxide).

Loading Devices for Automobile Cars.—The sub-committee has prepared drawings showing several representative hoisting attachments to the side plate or carline of automobile cars to be used as a guide and has also prepared a specification covering material, design, location and test loads required of these attachments. This information has been issued in circular form.

Rail-Motor-Car Axles.—The sub-committee has been working for some time with the American Electric Railway Engineering Association on the subject of suitable designs of rail-motor-car axles. A joint meeting of the Committee on Automotive Rolling Stock of the A.E.R.E.A. and this sub-committee was held on September 28, 1931, at which time stress calculations for axles E-11 and E-12 were presented. The results, however, were not altogether acceptable to the sub-committee and a further study was suggested to incorporate subsequent suggestions. Revised calculations have not been received and this sub-committee can report only progress.

Axles Equipped with Roller Bearings.—The committee has investigated the axle stresses in that design of roller bearing consisting of an A.R.A. axle surrounded by a tubular axle upon which the wheels are mounted and has found that the claims of the manufacturer are justified to some extent. The secretary has advised them that the stresses in any part of the proposed axle should not exceed the A.R.A. limit of 22,000 lb. per sq. in. and that to permit stress up to 22,000 lb. per sq. in. the sub-committee finds that the standard diameter of this special axle may be reduced slightly below the A.R.A. diameter at the center of the axle.

The report was signed by P. W. Kiefer (chairman), chief engineer motive power and rolling stock, New York Central; W. A. Newman (vice-chairman), chief mechanical engineer, Canadian Pacific; A. H. Fetters, general mechanical engineer, Union Pacific; C. L. Meister, mechanical engineer, Atlantic Coast Line; J. McMullen, superintendent car department, Erie; F. A. Isaacson, engineer car construction, Atchison, Topeka and Santa Fe; W. O. Moody, mechanical engineer, Illinois Central; C. B. Smith, engineer tests, Boston & Maine; T. P. Irving, engineer car construction, Chesapeake & Ohio; S. O. Taylor, master car builder, Missouri Pacific; G. S. Goodwin, assistant general superintendent motive power, Chicago, Rock Island & Pacific; J. J. Tatum, general superintendent car department, Baltimore & Ohio; E. B. Dailey, engineer car construction, Southern Pacific; B. S. Brown, assistant engineer, Pennsylvania; K. F. Nystrom, superintendent car department, C. M. St. P. & P., and J. P. Laux, superintendent motive power, L. V.

Box Car for Generally Unrestricted Interchange Service

Following its main report the committee presented an appendix setting forth its proposed design of a steel-sheathed wood-lined box car for generally unrestricted interchange service. In addition to a complete description of the special features of construction the appendix contains a complete set of general and detailed drawings. The plan under which it was produced was stated by the committee to provide a design which represented the latest state of the art with reference to weight, cost, construction, strength and general utility. Design standards and recommended practices pertaining to car-body construction were to be disregarded where the efficiency and value of the design as a whole would be adversely affected by their use. Provision has been made for the satisfactory applications of the principal specialties such as doors, ends and roofs. The design provides the largest car which may be moved freely in general interchange without extensive operating restrictions. It is 8 ft 9⅛ in. wide by 9 ft. 4 in. high by 40 ft. 6 in. long inside. The design effects a reduction in weight of 2,340 lb. as compared with the previous design having a height of 8 ft. 7 in.

Discussion.—In presenting this part of the report, Chairman Kiefer paid high tribute to the earlier work of the Car Construction Committee in developing the original standard designs and asked that it be kept clearly in mind that no comparisons in the report were made with the thought of discrediting the results of that work.

M. J. Gormley expressed satisfaction at the progress being made by the Mechanical Division, as indicated by this report, in arriving at a single standard box car which could be universally used. He stated that in response to an inquiry by the A.R.A. to the presidents of railroads owning over 8,000 cars, better than 90 per cent have approved the practicability of the proposed inside dimensions.

Action.—The report was accepted and submitted to letter ballot.

Report on Prices for Labor and Materials

In order that the rules may currently provide an equitable basis for inter-road billing, your committee has continued the work of analyzing material, labor and new equipment costs in A. R. A. Interchange Rules 101, 107, 111 and 112 of the Freight-Car Code, and Rules 21 and 22 of the Passenger-Car Code, with a view of determining and recommending necessary changes to be made in the next supplement to the current code.

Simplification of Billing

Your committee has given consideration to the setting up of prices for items applied to car (to include both labor and material), adoption of additional arbitrary prices and average weights, elimination of obsolete items and consolidations of items to eliminate extremely fine divisions. The modifications proposed herein will eliminate a net of 242 items from the rules and simplify the pricing, and it is felt will result in considerable decrease in correspondence regarding billing transactions. The recommendations submitted involve practically no change in the total amount of bills for car repairs and are explained in detail under the individual rules.

The proposed modifications have been checked and approved by the Arbitration Committee and, if adopted, it is recommended they be included in the supplement to be issued in July with effective date set at September 1, 1932, so that billing forces may have an opportunity to study the same prior to the effective date. To simplify matters and avoid confusion, the revised labor and material prices should become effective at the same time.

Rule 101—All miscellaneous material prices in Rule 101 were rechecked as of March 1, 1932. Quotations from the purchasing agents of 11 railroads, representing 39 per cent of the total freight-car ownership in the United States and Canada, indicated a slight downward trend on a number of items as shown in the detail exhibit following.

(The detail exhibit referred to here showed the recommendations for modifications to Freight-Car Rules 101, 107, 111, 112, and Passenger-Car Rules 21 and 22. The changes recommended were largely modifications of prices in line with current material quotations. The amendments proposed for items under Rule 107 were made largely to eliminate the fine divisions with respect to items and to simplify billing. The prices for dismantling various classes of freight cars were reduced, for example; dismantling box, stock and other house cars except refrigerators was reduced from $49.50 to $45.00.—Editor.)

All items covering applied prices, where labor is involved, have been modified to conform to reduced A. R. A. labor rates which became effective February 1, 1932.

The prices for box lids have been modified to establish a charge applied to car. New item covering brake-step boards applied is recommended. New items are added to provide net average prices for journal boxes, and the table of weights is eliminated. Consolidation of items covering dust guards, No. 1 and non-A. R. A. brake beams, and cylinder bodies, are proposed.

The wording of Items 17 and 18 has been modified. Items 22, 22-A, 158, 169-J, 169-K, 182 and 214, Interpretation No. 4, and table of weights for wrought-iron washers, are eliminated.

New coupler prices have been added and the list rearranged in proper sequence. Several new types of draft gears have been included. A new table of arbitrary weights for a number of miscellaneous items is recommended for convenience in billing.

Rule 107—A total of 188 items have been eliminated from this rule by consolidations, relocating items in Rule 108, on account of covering obsolete construction and items on which the allowance provided was based on the method of securement. It is felt that by applying the securement method of pricing to such items and eliminating the individual items from the code, the pricing will be simplified and at the same time overlap labor is automatically eliminated. The permissible jacking charge is eliminated from all but a few individual items and covered in new Item 219-A. New Item 240-A is set up to provide specific allowance for pins and key bolts, new Item 289-A added to cover screws applied to car, and additional details listed under Item 433, to provide for charging on securement basis.

Recommendations are also included to set up prices for various lumber operations on foot-board measure, to include material for paint, nails, screws, lags and bolts, which will obviate the necessity of computing both lineal foot and foot board measurements for pricing purposes as well as simplify the work of the write-up man at the car.

New Item 207 is added to provide a charge for replacing coop flooring in poultry cars. The allowances shown in this rule have been modified to conform to reduced A. R. A. labor rates which became effective February 1, 1932.

Rule 111—Item 29 of this rule is modified to establish a uniform charge to include additional details which at present result in many controversies. Item 6 is modified to establish an arbitrary uniform charge for various details which it is felt will also eliminate numerous controversies. The proposed changes eliminate 15 items from this rule. It is also recommended that when this rule is modified, the details of the various items be omitted from the rule book as unnecessary.

New allowances are based on reduced A. R. A. labor rates which became effective February 1, 1932, and on 10-inch brake equipment (instead of present 8-inch price basis), as the majority of cars now in service are equipped with the larger size.

Rule 112—Recommendations under Rule 112 respecting reproduction pound prices of new freight cars of all classes, are made in order that the supplement of August 1, 1932, may reflect 1931 costs in lieu of 1930 figures shown in the present code.

On account of the small number of tank and refrigerator cars built during 1931, and the fact that no poultry cars were built during that period, no change is recommended in the present per pound prices for these cars.

Pound prices for all other equipment were obtained from quotations on total output of the large U. S. manufacturers, and new prices submitted for your approval will be found to follow the trend which occurred in the 1931 market covering new equipment purchases as compared to 1930. An error in the formulas used for setting up Classes D, E and F prices was detected and corrected, resulting in a considerably larger proportionate decrease under these classes than obtains for Classes A, B and C. Figures from Canadian roads were not used as their total ownership is less than one-tenth that of United States carriers and the effect of including them in weighted average would be negligible.

The definition of refrigerator cars to be settled for on per pound basis is modified to conform to classifications shown in the A. R. A. Manual and to provide for settlement for additional classes of cars. The list of classifications for tank cars has also been brought up to date, to provide for additional classes of tank cars not covered in the present rule.

Passenger Rule 21—Item 1 is modified on account of a change in Passenger Rule 13. Item 5 was eliminated to permit new applied prices in Rule 101 to cover. The allowances shown in this rule have also been modified to conform to reduced A. R. A. labor rates which became effective February 1, 1932.

Passenger Rule 22—Your committee recommends the elimination of 41 items from this rule, which are simply duplicates of similar items in the freight rules and to which freight-car prices apply as specified in the third note following the rule.

Changes in material prices in a number of items under this rule are recommended, based on quotations as of March 1 from the purchasing agents of 11 representative railroads. Item 24 is modified to provide a charge for natural gas when used in lieu of Pintsch gas. The wording of Items 38-A and 38-B has been modified to clarify the intent.

It is the intent of the committee to investigate labor costs again in October, and if sufficient change develops, necessary revision will be made and inserted in the rules effective January 1, 1933.

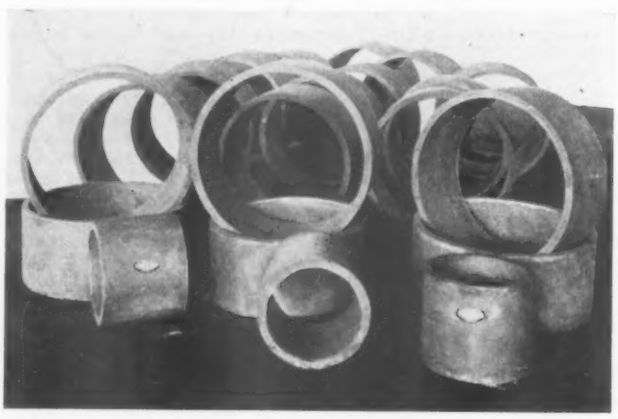
This report was signed by A. E. Calkins (chairman), superintendent rolling stock, New York Central; H. E. Myers, master car builder, Lehigh Valley; F. J. Dodds, general car inspector, Atchison, Topeka & Santa Fe; P. Kass, superintendent car department, Chicago, Rock Island & Pacific; O. A. Wallace, supervisor car repairs, Atlantic Coast Line; T. J. Boring, general foreman, M. C. B. clearing house, Pennsylvania; H. H. Harvey, general car foreman, Chicago, Burlington & Quincy; H. H. Boyd, assistant chief motive power and rolling stock, Canadian Pacific; A. E. Smith, vice-president, Union Tank Car Company and A. H. Gaebler, superintendent car department, General American Transportation System, Inc.

Action.—The report of the Committee on Prices for Labor and Materials was accepted.

Electric-Furnace Iron For Railroad Service

THE Cramp Brass & Iron Foundries Company now the Foundries Division of The Baldwin Locomotive Works, Eddystone, Pa., has for a number of years been producing a special brand of electric-furnace iron bearing the trade name Elfur. This material is extensively used in the construction of marine and Diesel engines, as well as for such locomotive parts as cylinder bushings, piston bull and packing rings, valve-chamber bushings, valve bull and packing rings, cross-head shoes and hub liners.

Elfur iron is manufactured under strict metallurgical control, and is produced through the medium of elec-



Group of Elfur rings to be machined and cut for piston and valve packing rings

tric-furnace melting. With this process it is possible to obtain far higher temperatures than are usual with cupola or air furnace methods of melting. This high melting temperature tends to rid the iron, not only of certain of its impurities, but also of its occluded gases, while its fluidity is greatly increased. This has the effect, aside from the composition of the iron, of producing a hardness in the metal through density—a result often obtained in other irons by using excessive quantities of steel. Another result of the method of manufacturing Elfur iron is to alter the graphitic constituent from the globular or large flake form to that of films which overlap each other so that, when subjected to abrasive conditions, the iron takes on a glazed surface, which increases its resistance to wear.

EDITORIALS

Intangible Assets

Some years ago one of our great industrial leaders made a statement to the effect that if some sudden destructive force were to wipe out his entire manufacturing plant over night he could, with his organization left to him, start over again and build up a successful business, but, that if he had left only his plant without his organization he would be foredoomed to failure.

Much has been said and written during the past 10 years of the so-called "machine age" that has created in the minds of many executives a gradually decreasing respect for the value of man-power and an increasing idolatry of the power of modern mechanical devices. A machine, however, as a productive unit, is no better than the brains and skill that controls it, and, during periods of enforced idleness, mechanical deterioration and obsolescence operate constantly and silently to decrease its value as a part of plant equipment. Man power, on the other hand, should increase in value during periods of business depression as a result of constantly meeting and solving the unusual and difficult problems of operation in the face of adverse conditions.

A railroad, probably more than any other major industry, must depend upon the initiative, loyalty and skill of its organization to succeed and it is to be hoped that railroad officers, when faced with the necessity of meeting the demand for further economies, will recognize in a personnel that has been trained by years of experience, an intangible asset that will be sorely needed when business arrives.

Accident Prevention

The American railways have made a notable reduction in accidents of all kinds in recent years and the mechanical department, both directly and indirectly, can lay claim to a considerable share in the making of this record. Incidentally, also, the safety first campaigns, started many years ago, broke a pathway into that field of greatest potentialities—employee co-operation. Here, in the first instance on a large scale, the employees were encouraged to make suggestions for betterments which affected not alone their safety, but, incidentally, the efficiency of operation as well.

Experience in conducting safety first campaigns proved most helpful also in 1923, when the American Railway Association announced in April a campaign to improve operating efficiency by the setting up of a series of goals which, high as they seemed at that time, were fully achieved within the year. This campaign, with the resulting improvement in the condition of equipment and higher operating efficiency, in turn was eventually reflected in the improved accident record.

In light of these facts, it was most appropriate that the American Museum of Safety saw fit to bestow upon R. H. Aishton, president of the American Railway Association, a certificate of special commendation "in recognition of more than fifty years of active and co-operative participation in the promotion of railway operating safety, and because, in a fashion peculiarly and forcefully his own, President Aishton has served as the general directing the forces battling on all fronts to make rail transportation safe for passengers and employees."

Mr. Aishton was associated on the Chicago & Northwestern with Ralph C. Richards, the "father of the safety first movement." He headed up the A.R.A. campaign for improved operating efficiency in 1923 and he sponsored the formation of the Safety Section of the American Railway Association and inspired its campaign for reducing employee casualties. The certificate of special commendation, therefore, was well merited, in spite of the fact that President Aishton modestly tried to evade credit for the accomplishment by insisting that it was due entirely to the great army of railway officers and workers who actually did the detail work in promoting the safety campaigns.

Splendid as the record made by the American railroads has been, the task has not by any means been completed. Too many passengers and too many employees are each year killed and maimed. Spurred on by the E. H. Harriman Memorial Awards and the spirit of President Aishton, let us go forward with still greater determination, intelligent effort and enthusiasm to overcome the remaining obstacles, and thus dramatically set before the American people an example of the high regard of the railways for the value of human life and its conservation. This may, in the last analysis, prove no small factor in securing recognition in the efforts of the railways to maintain their position in the face of competition with other types of carriers.

Washing Passenger-Car Sash and Trim

When passenger cars are to receive general repairs in a back shop, the sash, doors and other interior trim, as well as the car exteriors, must be thoroughly washed to provide clean surfaces preparatory to painting. In March, 1932, the sash and door department of the Milwaukee (Wis.) shops of the Chicago, Milwaukee, St. Paul & Pacific adopted the spray method for washing stripped car parts, superseding the former practice of hand washing. As shown in an article elsewhere in this issue, the spray method now in successful operation, has reduced the labor cost per car for this operation from an average of $7.70 to $5.39, or a saving of practically 30 per cent.

Several years ago, spray booths were installed in the sash and door department at Milwaukee shops to reduce the cost of painting sash, doors, etc. By January, 1931, four spray canopies were employed to paint car bodies, reducing the labor cost for such work over 50 per cent, compared with brushing costs, as described in detail in an article beginning on page 292 of the *Railway Mechanical Engineer* issue of June, 1931. A study

made early in 1931 showed that the spray painting of car bodies had thrown the hand-washing costs out of line. The spray washing of car bodies was, therefore, adopted in April, 1931, resulting in a labor saving of over 50 per cent, as described in another article beginning on page 590 of the *Railway Mechanical Engineer* issue of December, 1931. A study indicated that the cost of washing sash, doors, etc., was too high in relation to the painting of such parts and the washing of car bodies. The spray painting of sash, doors, etc., was, therefore adopted in March, 1932, effecting still further important economies, as described in the article mentioned in this issue of the *Railway Mechanical Engineer*. With this final adoption, complete spray equipment for washing and painting passenger-car bodies and interior stripped parts is available for the first time at the Milwaukee shops.

While somewhat more material is generally used in spray painting or spray washing, as compared with former hand methods, increased material costs are far more than offset by large savings in labor costs and, in many respects, the quality of workmanship is improved. In the case of passenger-car washing by the spray method, the savings per car are small, but when multiplied by the hundreds of cars which must be washed at back shops preparatory to general overhauling or at terminals during normal operation, the potential aggregate savings are highly attractive. Results achieved on the Milwaukee, as well as on a number of other progressive roads, in spray washing passenger equipment, make this practice worthy of the closest consideration for more extensive general adoption.

Careful Planning Will Reduce Expenses

There is no argument but that there are many mechanical-department officers and supervisors working under an emotional strain which, in some cases, verges on hysteria. Much of this mental wear and tear is due to the conduct of superiors who have allowed worry to get the better of their good judgment. As a natural sequence of psychological events, these mental reactions of the management are carried all the way down the line. Some have tried to avoid this by assuming an over-optimistic attitude which even the least informed know is not sincere. Others have bent their energies toward maintaining an even tempo and have calmly set to work to solve each new problem as it has come up.

The mechanical-department officer of an eastern road was asked the question, "How are you keeping within your reduced budget and at the same time keeping your power on the road?"

In reply the officer showed how all of the repair work was being concentrated during the boiler-wash period. All the work reported is performed; nothing is held over. Light class repairs are made in the enginehouse and medium class repairs are made in one of the larger enginehouses where advantage is taken of the close proximity of the enginehouse to the machine shop of the road's principal back shop. Enginehouse forces, which are accustomed to work under pressure, make the heavy repairs when there are few or no running repairs to be made on locomotives in service. A few men in the machine shop are able to turn out all the machine work required. With this system, the mechanical department is able to balance the short working periods of the back shop by using the enginehouse forces full time.

None of the supervisory force has been laid off. Seniority rights are used to keep the supervisory staff intact. As a result, there are a number of assistant foremen and gang foremen working as machinists. But they are available for their former positions when business picks up.

The management has issued strict orders against "robbing" power in storage. Locomotives required for the summer vacation business have been conditioned and are ready for service. As to be expected, stores are kept at a minimum figure and shortages of items occur. These material shortages are not allowed to remain. Needed items are purchased, advantage being taken of the facility for quick deliveries and the fact that slack business on the road has created a reserve of locomotives.

Here are the results. By careful planning and taking advantage of all the factors entering into each situation, the engine-terminal expenses for one month was over $8,000 under the allotment charged to maintenance of equipment accounts, and this saving is being continued. There was a reduction of 15 per cent in reported engine failures for the month as compared with the same month of last year. The cost of handling engines has been reduced 11 per cent and the cost of handling fuel will be reduced by 15 per cent.

All this has been accomplished by clear heads and hard work. Sane recognition of the situation as it exists is the best basis for constructive action.

Comparisons of Switching Power

There can be no question that railroads are looking with increased favor on gasoline- and oil-electric locomotives for switching service. The former have demonstrated a marked flexibility and economy for light industrial switching operations and the latter for all except the heaviest yard switching and transfer service. In all comparisons of the performance of this type of power with that of the conventional steam locomotive, the relative operating costs and performance data should be set up for locomotives of similar age, used in the type of service for which they were designed. In other words, no accurate picture of the savings possible with an oil-electric locomotive, for example, can be obtained by comparing it with a steam locomotive which was, perhaps, originally designed for road service and which is so old that 25 per cent, or more, of its total operating cost consists of maintenance charges.

The principal advantages inherent in the design of oil-electric locomotives include high availability, fuel economy and practically full horsepower development throughout the speed range. In addition, fuel standby losses are eliminated, the labor cost of operation reduced and terminal attention minimized. These advantages must be balanced against the relatively lower weight and first cost of equivalent steam locomotives. With differences in operating cost of $2 to $3 per hour, however, in favor of oil-electric locomotives, largely depending upon whether they are operated with two-men crews or one-man crews, the earnings from the installation of this type of power often are far more

than adequate to offset the lower cost of steam power.

Undoubtedly, under conditions best adapted for economical steam operation, oil-electric locomotives may not show sufficient earnings to justify the investment, but, where conditions permit operating multiple shifts, and where possibly one-man operation can be substituted for two-men crews, these savings, coupled with fuel economy and reduced terminal expense, make the investment in oil-electric locomotives unusually attractive. Each case must be judged on its individual merits, with due regard to the fact that the internal-combustion locomotive is still a comparatively new development, with only a limited amount of information available regarding maintenance costs, on a long-time basis. The merits of this type of power, however, are such that neither in the interests of the railroads nor of the equipment manufacturers, themselves, is it desirable to make comparisons with steam power which is obsolete or unfitted for the work at hand, or which, on account of its age, is subject to excessively high maintenance charges.

The Mechanical Division Meeting

The annual meeting of the Mechanical division of the American Railway Association, held at Chicago on June 23 and 24, a report of which appears elsewhere in this issue, was not characterized by its enthusiasm, coming as it did at the end of two years of constantly increasing pressure for curtailment of every activity not essential to the continued functioning of the railroads. As was to be expected, the attendance was not large in numbers, but it is significant of the interest of the railroads in the work of the Mechanical Division, that the approximately 150 members in attendance, represented over 50 railroads and private car lines. The character of the work being done by the Mechanical Division is, perhaps, better indicated by the reports of the committee than by anything which transpired at the meeting. While some committee projects have been deferred to curtail expenses, there was the same evidence of painstaking and constructive study and conservative judgment which has made for steady, if not spectacular, progress of the Mechanical Division in working out the common problems of equipment operation and maintenance.

Most of the important reports involve an immense amount of detail work, a fact which is clearly evident in their text. What is not so evident, however, is the amount of patient negotiation between committees and manufacturers or shippers, on the success of which depends the co-operation essential to orderly progress, and some of which has an important bearing on building good will for the railroads.

The outstanding recommendation placed before the members this year was the proposed design for a steel-sheathed wood-lined box car for generally unrestricted interchange service, on which the Car Construction Committee began work in co-operation with the Committee on Car Design of the American Railway Car Institute last August and which was presented in complete detail. This is not a compromise design and it departs in numerous respects from the existing design standards and recommended practices where the efficiency and the value of the design as a whole would have been adversely affected were these standards to have been followed. The inside height of 9 ft. 4 in. represents the maximum which can be utilized without restricting the use of the car in interchange. The saving in weight which the committee has been able to effect by its method of approach to its problem amounts to more than a ton per car. This design is believed to possess outstanding economic advantages and it represents a major achievement in the work of Mechanical Division committees. Whether the unrestricted interchange feature will be of sufficient importance to bring all railroads into agreement in respect to the dimensions is a matter for future determination.

Another recommendation of unusual interest was placed before the meeting by the Committee on Wheels for the elimination of the chamfer on the tread, providing one straight taper of one in twenty from the fillet of the flange to the side of the rim. This is a departure from a long standing precedent. It met with much favorable comment and no strong objections.

Another significant development is the recommendation of the Committee on Prices for Labor and Material for the deletion and consolidation of items in the price rules which reduces by 242 the number of billing items. It is to be hoped that this is but the first step in the progress of the Mechanical Division towards the much greater simplification of the inter-railroad transactions pertaining to interchange repairs on which the Arbitration Committee is working.

One of the high lights of the meeting was the opening address by H. A. Wheeler, newly-elected president of the Railway Business Association, who said that the railroads are now faced with more numerous and more difficult problems than have confronted them before but that a reasonable hope for better conditions lies in the recent swing toward a generally favorable public sentiment which should, in the near future, result in a relief from burdensome railway legislation, affording the roads freedom of action in meeting the competition of other transportation agencies.

Mr. Wheeler said that a great responsibility rests with the railway executives who must agree upon a program subordinating individual rights and prerogatives in favor of the general interest of the public.

In connection with the use of modern railway equipment, Mr. Wheeler stressed particularly the importance of replacing antiquated cars and locomotives with equipment of the most modern type, not only to reduce operating costs but to effect substantial reductions in the cost of maintenance and repairs. Such self-liquidating purchases of equipment, Mr. Wheeler said, would be not only profitable to the railroads but highly important to the country through the expansion of employment in many lines of associated business activity. The railroads are the largest single buying group in the United States.

They can hardly be asked in justice, according to Mr. Wheeler, to incur more indebtedness than they have already done in order to turn the tide, but increased railroad earnings can be obtained only from handling increased tonnage more efficiently and, therefore, in the interest of self-preservation it would appear that the railroads should enter the market for self-liquidating equipment and supplies, particularly when they can be paid for out of future earnings and not constitute a drain on present cash resources.

As hopeful tendencies, Mr. Wheeler mentioned the corrective influence of time, a reasonably balanced national budget and aroused public sentiment for government economies, reduced bank failures, increased powers and resources of the Reconstruction Finance Corporation and low present prices and inventories.

THE READER'S PAGE

Advantages of Annular Nozzle

To the Editor:

I note with interest the article on Relation of Back Pressure to Locomotive Performance in the June issue of the *Railway Mechanical Engineer*, page 219, and the fact that the advantage of the annular ported nozzle is emphasized.

This recalls to mind the articles in the *Railway Mechanical Engineer* of June, July and August, 1918, by our engineer of tests, H. W. Coddington, on Drafting Modern Locomotives, in which he gave the results of a series of tests with the annular nozzles.

The final conclusions of Mr. Coddington's report are very decidedly advantageous to the use of the annular nozzle, which allows for a very much larger stack, which can be operated efficiently and produce the needed draft in the locomotive with decreased back pressure.

Considering the results obtained from the tests which were made and published at that time, we have often wondered why this type of nozzle was not more generally used, it having virtually become the standard on the Norfolk & Western.

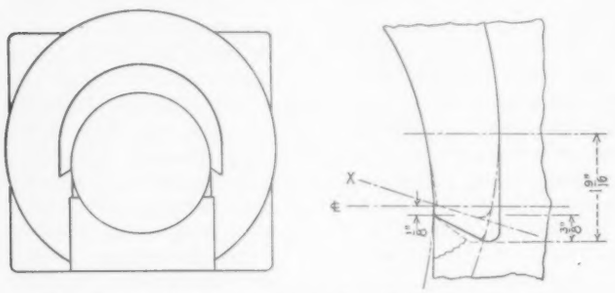
John A. Pilcher,
Mechanical Engineer, Norfolk & Western.

Preventing Locomotive Hot Boxes

To the Editor:

The increased high speed and bearing pressure on plain locomotive bearings, particularly on driving axles, induces heating, springing of the crown brass, and then further heating due to closure of the bearing. This results in the inevitable thermal checking, incipient microscopic cracks and fractures.

Some years ago the Mechanical Division of the



Sketch showing how the angle of the crown brass was increased

American Railway Association recommended that the angle of the crown-brass edge be increased ⅜ in.

The detailed sketch shown is taken from the drawings of a western railroad. The angle was not only increased to include the ⅜ in. recommended, but also to gain additional bearing surface over the old-style bearing by detailing a tangent to have the crown-brass extend further below the horizontal center line.

The change reduced the number of hot-boxes reported and, no doubt, reduced the number of axle failures as well as extending the life of driving boxes. The dotted line *X* indicates the old style.

No difficulty has been experienced in machining the brass or driving box as the work had always been finished on a slotter.

F. Rattek.

Hidden Treasures Are To Be Found

To the Editor:

Hidden Treasures? Yes, they are to be found for the looking, in shops, large and small—diamonds in the rough, ready for the polishing by an opportunity, a little coaching and a little experience, into that rare combination of knowing the work and knowing the man—but, if this material prefers to hide in the background, or knows not how to get out of it, it will naturally be assumed that it belongs there and there it will stay.

In "B.T.'s" article in the April issue of the *Railway Mechanical Engineer* wherein he takes a fall out of the editor, is this a real condition, or is it a lure to hook some one into expressing an opinion? Here goes; we bite. Or is it an actual condition and a confession on B.T.'s part that the shoes that Bill, Tommy, Mike and the balance of the 32 cannot fill are not at present filled? The spirit, efficiency and output of the shop depends directly on the foreman's handling.

Some foremen start with a whiz like a toy locomotive, jump the track after the first round and smash into the table leg, are wound up again and again, making numerous starts and getting nowhere; others start like an anthracite fire, slowly, without sparks or loud crackling, at first seemingly not very hot, taking it gently, getting their bearings, warming up hotter and hotter, and do they get results? And how! The most successful foreman need not be a driver, but he must be a good judge of human nature. The driver usually hides the fact that he lacks the necessary attributes behind his driving. No deception should be practiced and nothing told or promised that can not be carried out, thereby gaining the confidence of the men. As no two are exactly alike, an elastic system must be used to handle each individual with firmness and tact, but at the same time every man must be handled the same as far as favoritism is concerned and every man made to feel that he is a part of the business.

The pendulum swings. When it was swinging high a few years ago when efficient, competent labor was not available to supply the demand, many articles were published in all the leading mechanical magazines as to the attributes of a good foreman and how he should treat the men fairly to hold them and get the best results, but now that the pendulum has swung high in the opposite direction and the whip hand has changed, such articles are rare, but now more than ever, due to the critical condition of our railroads and other industries, results are wanted and the utmost efficiency and economy necessary. Human nature is the same the world over and, if the men are treated with fairness and handled as a foreman should handle them, the work will be turned out and much good obtained in the way of helpful suggestions from the men and in the pinch 90 per cent of them will respond and go the limit on the long pull, the strong pull and the pull altogether.

"Sandy."

With the Car Foremen and Inspectors

Spray Washing Passenger-Car Sash

THE spray equipment recently installed at the Milwaukee (Wis.) shops of the Chicago, Milwaukee, St. Paul & Pacific for washing sash, doors and other parts removed from cars is made and assembled, except for the hose and nozzles, from second-hand material. The cost of manufacturing and assembling the outfit was small. The illustration shows details of the equipment, which can be modified to suit the needs of any coach shop.

The equipment consists of a washing tank, two material solution tanks, one rinsing water hose with nozzles, two material hose with nozzles, together with the necessary air, water and material solution pipes, fittings and valves. The water is obtained from city lines, but passes through a tank where it is heated by steam.

The washing tank, made of wood, is the same one that was used with the hand-washing method. The tank has a capacity for three doors or eight sash of standard size, and is large enough to avoid frequent loading and unloading of articles being washed. This permits maximum productive work with a minimum lost time from handling. The sash, etc., are laid flat in the tank on wooden racks which are slightly tipped backward to drain off the surplus solution and water.

To fill a solution tank, the pop-off valve is removed and the cleaning compound is poured in the tank. Warm water is then added by means of a short rubber hose that hangs between the two tanks and which is fastened onto the warm water pipe. On the larger tank, a water glass shows how much solution the tank contains at all times. The contents of each tank can be emptied into a sewer pipe by merely opening a drain valve at the bottom of the tank. The tanks contain sufficient solution to wash all the stripped parts from about 1⅔ large steel coaches.

Material in the solution tanks must be thoroughly agitated before being used. The agitating is done with compressed air. Inside each tank, near and parallel to its bottom, is located an air pipe with numerous small holes that point downward. When air to the "agitating" line is turned on, a circulation is obtained in the tank which thoroughly mixes the water and cleaning compound.

The cleaning solution is forced up from the tanks into the pipes over the washing tank and out through the hose and nozzles, by means of injecting a downward air pressure of about 40 lb. on the contents of the tanks. By using this method, fumes are avoided.

The nozzles in the material hose throw a cone-shaped spray which soaks the articles being washed, and then the material is allowed to dissolve the dirt.

View showing the operation of spray-washing passenger-car sash at the C. M. St. P. & P. shops, Milwaukee, Wis.

The washing tank is used as a receptacle in which articles are sprayed, and is built to drain off.

The large tank for material solution has a capacity of about 60 gal. and holds the solution that is used to clean doors, sash, stops, etc. The tank and its pipes and valves are painted green. The smaller tank has a capacity of 10 gal. and holds a stronger solution which is used on extremely dirty hoppers and ventilators. This tank and its pipes and valves are painted red. Both tanks have separate distributing pipes and are independent of one another.

On the other hand, the nozzle on the water rinsing hose throws a fan-shaped spray which has sufficient force to drive the dirt and surplus cleaning material off the pieces being washed. The hose for the weaker solution and the rinsing water are suspended from towers so as to keep them always within reach of the workman and out of his way when not being used. The hose for the stronger solution is used only at infrequent times and is suspended from the overhead pipe. When not in use it is hooked onto the pipe. The two towers were made from buffer springs,

nipples and floor flanges, pipes with bushings, and with a hose running through the pipe and connecting at one end to the overhead water and material lines and at the other end to the nozzles.

Warm water was obtained, under the former hand-washing method, from piping that led from a tank where steam was utilized to heat the water. This warm-water outfit is used for spray washing by a re-arrangement of the distributing pipes.

Hand and Spray-Washing Methods

Under both the hand and spray-washing methods, one man (a painter helper, 57 cents per hour) is considered as constituting a washing gang. He takes the pieces to be washed off the skids and places them in the washing tank. Cleaning solution is then applied to the pieces, scrubbed, and rinsed off. The pieces are then turned over in the tank and cleaned on the other side. The tank is unloaded on completion of this work and the pieces placed on end in the drying rack. The tank is then refilled and the performance repeated. The table shows that the 392 pieces from a 72-ft. steel coach required a total of 28 washing-tank loads.

With the former method, the application of the cleaning solution was done by hand by means of a brush and bucket, and the rinsing off with water was done by juggling the pieces under ordinary water faucets located at the rear of the washing tank. With the present method, the application of the cleaning solution and the rinsing is done by spray. With both methods, the loading and unloading of the tank, and the turning over of the pieces in the tank, are done by hand. Under the spray system, warm cleaning solution and warm rinsing water are used. While scrubbing is necessary to loosen up the dirt, less scrubbing is required, due to the solution dissolving the dirt, than was the case under the hand method.

Spray washing of car parts has several advantages over hand washing. It is less monotonous, less tiresome, and is performed with modern, rather than crude, tools. The work is made easier and more interesting. Scrubbing and handling are minimized. Larger areas can be cleaned at one time. The result is increased output which means lower costs. At the Milwaukee shops, the workmen expressed their preference for spray washing on the grounds that it is easier work.

Reduced Performance Time

In making time studies of spray washing, 72-ft. steel coaches were selected because they have the largest number of stripped parts of any car and thus require a maximum of washing and handling.

The washing costs in the Milwaukee shops' sash and door department were recently reduced in two ways. First, mass-production washing methods replaced the individual method of washing pieces. Second, the spray method replaced the hand method. Formerly the hand washing of sash, doors, etc., from a 72-ft. steel coach took from 20 to 21 man-hours. It was customary for each sash, door, etc., to be handled and washed as an individual item. This system was replaced by having the washing tanks loaded to capacity and considering the tank load as an individual item. Again, a straight-line movement was installed for handling the articles in and out of the washing tanks. These methods of production, and by eliminating slack, reduced the performance time to about 13½ man-hours per large steel coach. These 13½ man-hours were consumed by the fastest sash and door washer employed at Milwaukee shops.

Even after the reduction in washing time from 20 and 21 to 13½ man-hours, the cost was still considered too great and the washing methods antiquated. Spray washing was then installed and the table shows that this method further reduced the washing time to 9 hr. 27 min. per large steel coach. This time was obtained by a sash and door washer of average speed. It can be safely stated, therefore, that spray washing reduced the washing time from 13½ to 9½ man-hours. The labor cost per car was, therefore, cut from $7.70 to $5.39, a saving of $2.31, or 30 per cent.

Time Study Made of Spray Washing the Sash, Doors, and Trimmings from a Steel Coach*

Articles washed		Total number of pieces washed	Number of washing tank loads	Average pieces per washing tank load	Washing operations, min.					
Group	Articles				Take pieces off skid and put in tank	Spray, brush, rinse (one side)	Turn pieces over in tank	Spray, brush, rinse (other side)	Remove pieces from tank and put on dry rack	Total productive time
Stops	85 inside stops 20 single sash stops 82 parting stops	187	2	93.5	13.0	7.0	5.5	5.5	6.0	37.0
Sash	43 outside sash 4 end door sash 20 large top sash 3 small top sash 43 inside sash	113	16	7.1	25.5	79.0	13.5	73.0	41.5	232.5
Doors	2 toilet doors 1 locker door 2 body end doors 4 vestibule doors	9	3	3.0	4.0	23.5	3.0	16.0	7.0	53.5
Screens and Vents	5 screens									
	19 ventilators	24	2	12.0	3.5	17.5	2.5	21.0	4.0	48.5
Hoppers	2 bowls 2 stands 2 seats 2 covers	8	1	8.0	3.0	56.0	...	...	3.5	62.5
Glassware	14 lamp bowls	14	1	14.0	2.5	7.0	...	...	2.5	12.0
Odds	2 hallway iron rods 6 smoking room seat arms 23 curtain rails 3 soiled cup holders 2 drinking cup holders 1 stepping box	37	3	12.3	8.5	15.0	1.5	11.0	5.5	41.5
Total		392	28	...	60.0	205.0	26.0	126.5	70.0	487.5

Summary—Distribution of Productive Time

Spray, brush, rinse	331.5 min.	68 per cent
Handling	156.0 min.	32 per cent
Total	487.5 min.	100 per cent

Summary—Distribution of Gross Time

Productive time per above table	487.5 min.	86 per cent
Non-productive time—fill material tanks, clean out washing tank, toilet, etc.	79.5 min.	14 per cent
Total	567.0 min.	100 per cent
Equivalent man hours	9 hr. 27 min.	
Labor cost at 57 cents per hour	$5.39	

* C. M. St. P. & P. Coach 4207—steel construction—72 ft. 6 in. long over body end sills.

The material used for washing sash, doors, etc., is a purchased cleaning compound and is the same as is used in the spray washing of car bodies. For washing sash, etc., the Milwaukee shops mixes this cleaning compound in the proportion of one quart to 10 gal. of water. This is the so-called "weaker" solution that is used to clean sash, doors, stops, etc. The same material is used in the stronger solution that is employed to clean hoppers and ventilators, and is mixed at the proportion of three quarts to 10 gals. of water.

To spray wash the car given in the table, 36¼ gal. of cleaning solution were used. The cost of the material used was about 91 cents, which compares with about 80 cents for washing a similar car by the hand method.

Savings and Workmanship

By substituting the spray method for the hand method in washing sash, doors, etc., it was possible to save in direct labor and material about $2.20, or 26 per cent per steel coach. The savings for other classes of cars are proportionate. While the savings per car are small, these savings, when multiplied by hundreds of cars, result in a large annual saving. The workmanship obtained from spray washing equals or excels that obtained from the hand method. The spray equipment described in this article is also suitable for washing storm sash at terminals.

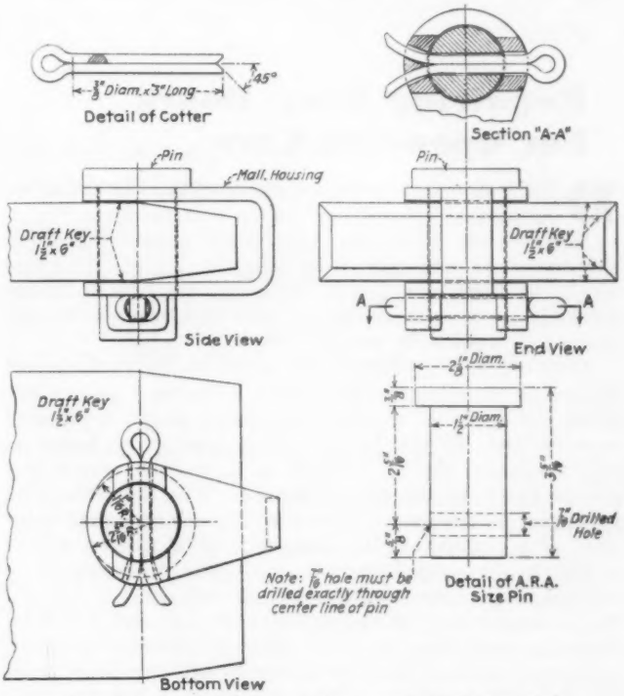
Safety Lock For Draft-Key Retainers

WITH the object of eliminating the trouble experienced by many railroads with cotter keys losing out of the A.R.A. draft-key retainers the American Railway Products Company, Inc., 74 Washington street, South Norwalk, Conn., has developed what is known as the Cooke Super Draft-Key Lock. This draft-key lock was applied to a coal car on an eastern road in October, 1930. It was in trial service for a period of 18 months. An inspection of this lock on May 10, 1932, which was made and reported by the railroad, showed it to be in as good condition as when originally applied.

Application of the Cooke super draft-key lock

Referring to the drawing, two holes are drilled at an angle of about 45 deg. so that the junction of the holes is at the center line of the cotter-pin hole. The cotter is inserted in the holes and a few taps of the hammer causes the cotter to split at the junction and bend.

The act of driving the cotter to position locks the housing, pin and cotter to the draft-key. This locking arrangement holds the cotter and pin rigid, which prevents wear and vibration. The prongs of the cotter cannot be bent together, thus the cotter cannot become loose and fall out. This draft-key lock is designed for A.R.A. standard diameter pins. The housings are made of malleable iron.



Assembly and details of the super draft-key lock

Questions and Answers For Air-Brake Foremen

Following is the last of a group of questions and answers selected from the instruction pamphlet recently revised by an eastern road:

Q.—What should be noted with respect to the air-signal whistle and air-signal pressure? A.—That it responds to a reduction of 1 to 2 lb. made by opening the pet cock of the testing device quickly for a second or two with the device applied to the signal-line hose coupling and with the signal-line cut-out cock open. Signal-line pressure should be between 40 and 43 lb. as registered by the test-device gage.

Q.—If fluctuation of brake-pipe pressure exceeds 2½ lb., what defects may be indicated? A.—Excessive supply-valve piston friction, excessive brake-pipe leakage or defective internal parts in the feed valve.

Q.—If the brake-pipe pressure remains constant at standard pressure with 1/16-in. orifice open, or fluctuation of pressure does not exceed 2½ lb., may the feed valve be considered serviceable? A.—Yes.

Q.—What is indicated by the fluctuation of brake-pipe pressure with the testing device applied to the brake-pipe, with the angle cock open, brake valve in running position and the pet cock open? A.—Opening and closing of the feed valve.

Q.—If signal-line pressure registers higher than standard with the test device applied to the signal line and with the cut-out cock open, what is indicated? A.—The reducing valve is improperly adjusted or defective.

Q.—If lower than standard, what is indicated? A.—The reducing valve is improperly adjusted or defective, excessive signal-line leakage or wrong spring applied in the strainer and check valve.

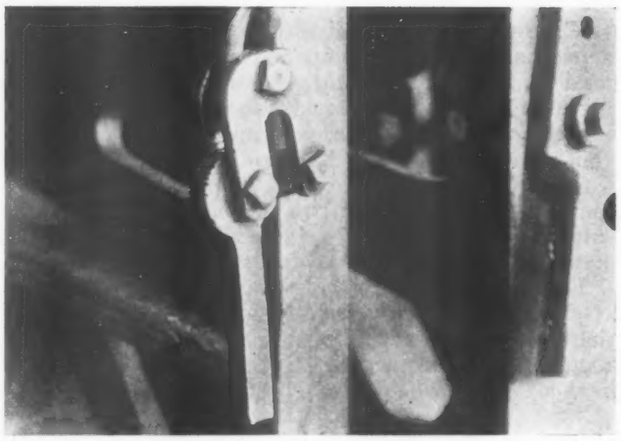
Q.—If the signal whistle fails to respond when the 1/16-in. orifice of the test device is opened and with the signal-line pressure reduced from 1 to 2 lb., what may be indicated? A.—The choke fitting is enlarged or missing, the diaphragm-valve stem is too tight or distorted, or baggy diaphragm, or the bell of the whistle is improperly adjusted.

Repairing Drop Doors For Open-Top Cars

DROP doors are repaired or rebuilt in the car shops of a western railroad under a large press which is located near the station spot in the repair line where the doors are removed from the cars. After the press work has been completed, the doors are routed to the steel shop where the straps, angles and other stiffening parts are welded in place.

This work is performed on a revolving rack shown in one of the illustrations, which rests on a base made from the head of a scrap stationary boiler of barrel construction. If the head from a stationary boiler is not available, the door from a locomotive smokebox can be used for the same purpose. The boiler head is arranged to revolve. The pivoting arrangement consists of a circular ½-in. plate, 4 ft. in diameter, which is laid on the shop floor. A plate 14 in. in diameter, is welded to the center of the 4-ft. circular plate. Around the circumference of this top plate is a groove for 1-in. diameter ball bearings. A plate of similar grooved construction, to which the boiler head is welded, rests on the ball bearings. The grooves in the top and bottom plates retain the ball bearings in position.

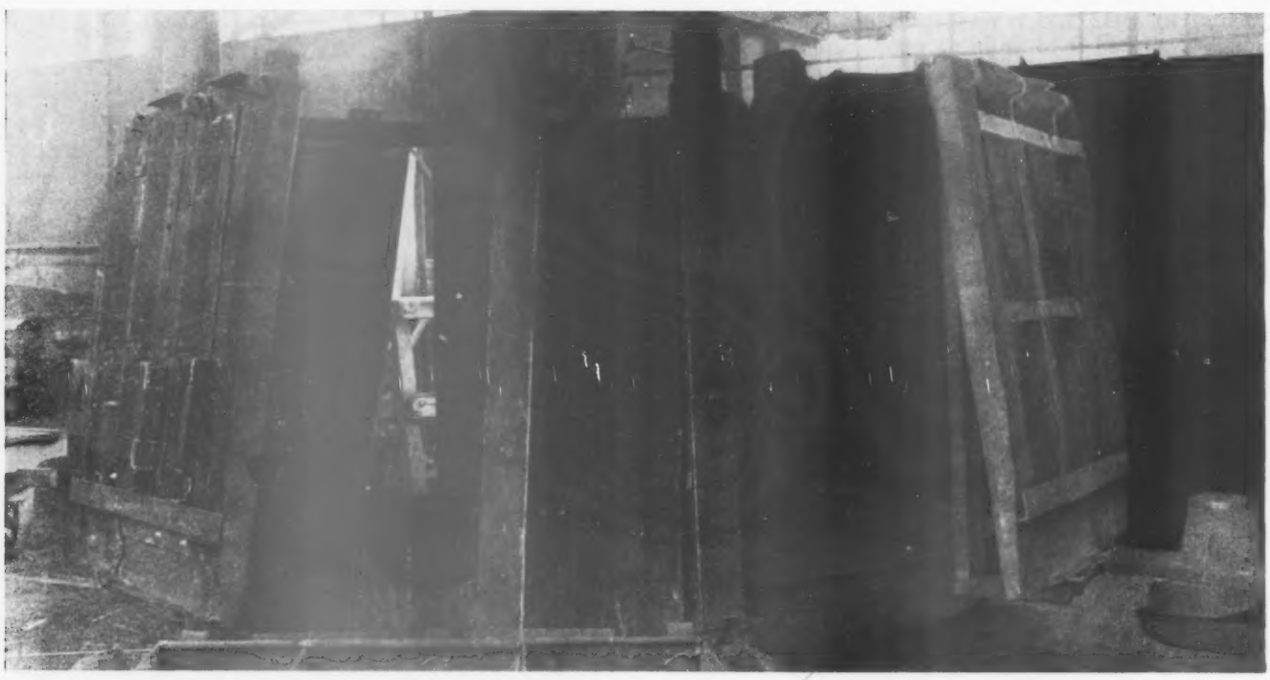
Four trunnions having 1 in. thick by 4 in. diameter steel disc wheels are welded to the outer jaws of the 4-ft. base plate to afford rigidity to the boiler head. However, the boiler head is so adjusted that practically all the weight rests on the ball bearings and comparatively little weight is carried on the four trunnions.



Clamp hook on the chain of a monorail hoist for transporting door sheets from heating furnace to press

Two 14-in. sections of 4-in. channel, which serve as supports for the drop doors as shown, are welded to the flange of the boiler head. Approximately 2 in. of the central portion of the channel is turned up at the outside edge to prevent the doors from slipping off the rack. Two vertical sections of 4-in. channel which are welded to the bottom channel and to the upper frame structure of the rack serve as rests against which each door is leaned. These vertical channels are applied with a slight slope toward the center to prevent the doors from falling off when the rack is revolved. The upper frame structure is made of 1-in. square bar and is braced by two light cross angles. The rack has a capacity for six doors.

Three welders work at the rack. Each welder is assigned a certain part of the work which is so apportioned between the three men that the working time is approximately the same. With this arrangement and division of work, each welder finishes his part of the work on each door so that when the rack is revolved to the next position he can continue on the next door



Revolving rack for welding drop-bottom doors for hopper and gondola cars

without delay. The rack is loaded on one side and the finished doors are removed on the opposite side.

When new doors are required, a considerable saving is effected by cutting and forming the sheets in the steel shop. The sheets from which the doors are made are of ¼-in. material and as much as possible of the corner slopes and recesses are cut on a throatless shear. The recesses are then squared up with a cutting torch and the burrs removed with a small portable grinder. On completion of this work the door sheets are heated to 1,600 deg. F., after which they are transported from the furnace via a monorail hoist to a press which is located approximately 50 ft. distant from the furnace.

The press, shown in one of the illustrations, is made from a scrap wheel press which is fitted with two cast forming blocks for shaping the sheets. The male die is arranged to move back by a counterweight when the pressure in the air cylinder is relieved. As the die blocks on the press are vertical, a plate is provided underneath to receive the door sheets as they drop into the press. A latch of 1-in. by 4-in. bar steel, 14 in. long, is secured to one side of the die block. This

A scrap wheel press is used for flanging the door sheets

latch is pivoted to the female die by a stud and is placed across the opening between the two dies when a door sheet is to be inserted. This latch arrangement stops the sheet at the correct distance. The latch is held in a horizontal position by a pin which is inserted through a hole drilled through the back end of the latch and into the die.

The flanged door sheets are handled to and from the press with tongs, the jaws of which are lengthened and bent at right angles so that the handles are in a horizontal position convenient for the workmen.

The monorail hook illustrated, which is used to transport the hot door sheets from the furnace to the press, consist of two U-shaped plates which are bolted together by three bolts. The center bolt, which is located at the bottom of the U, is used to secure the clamp to the hoist chain. A second bolt, which is located at the upper end of one of the arms of the U-shaped plate, passes through a square steel block which is provided with corrugations on the inside face. The third bolt is located directly opposite and secures a 2-in. by 8-in. handle which is used to clamp the door sheet to the corrugated block. The bolt hole through the circular head of the handle, on the edge of which corrugated grooves are also cut, is located off center so that simply by moving the handle up clamps the hot plate securely. Moving the handle down releases the plate.

Decisions of Arbitration Cases

(The Arbitration Committee of the A.R.A. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

Defect Card Sustained— Claimed to be Issued in Error

On August 31, 1929, Carolina, Clinchfield & Ohio all-steel hopper car No. 42288 was delivered to the Seaboard Air Line by the Atlantic & Western interchange at Sanford, N. C. A. & W. defect card reading, "One steel side bulged out 18 in. and one side sill sprung (owner's defects)," was attached to the car, which was all-steel with two longitudinal sills. On September 19, 1929, the Clinchfield advised the A. & W. that an inspection of the car upon arrival at its home shops revealed that both the metal center sills were bent down about 5 in. at the center of the car. An additional defect card to cover this damage was requested. The A. & W. declined to issue an additional defect card to cover the damaged center sill and also advised the owners that it would not accept a bill for repairs covered by a defect card issued at Sanford, as this damage was the owner's responsibility. The car was repaired by the Clinchfield and the A. & W. was notified that a bill would be rendered on authority of its defect card. Accordingly, a charge of $112.69 for repairs to the steel side was included in the Clinchfield car repair bill No. 5866 against the A. & W. No charge for repairs to the center sills or associated parts was included in the bill. The A. & W. refused to pay this bill, contending the car had not been accorded any rough handling nor involved in an accident on its line, but that the car had collapsed in fair service and that the defect card was not authority to bill in view of the notation "owner's defects." The Clinchfield contended that the notation "owner's defects" had no bearing on the authority of the defect card which is authority to bill according to the Rules 5 and 94 and Arbitration Case 1398, and was issued in order to interchange the car. It also contended that the damage to the side of the car was directly a result of the center sills being bent, which is a handling line's responsibility under paragraph 5 of Rule 44. The A. & W. submitted a report of the joint inspection which was made by A. & W. and S. A. L. inspectors. The Seaboard inspector, according to the report, stated that the damage was the owner's responsibility, but that a defect card so endorsed should be attached to the car so that the car owner would know on what road the damage occurred. The Clinchfield in its statement pointed out that subsequent correspondence developed that the defect card had been issued by the agent of the A. & W. at Sanford upon request of the agent of the Seaboard and evidently under protest. It

claimed that apparently neither of these agents were entirely familiar with the A.R.A. Rules of Interchange, which resulted in the car being accepted by the Seaboard with both center sills damaged between the body bolsters and with no defect card to cover and that the card was issued irregularly. It claimed that the labor for removing, repairing and replacing or renewing the center sills on this class of car exceeded the limits of Rule 120. If the damage in this instance had been the owner's responsibility, the car should have been handled for disposition under Rule 120 with a statement attached showing the circumstances under which the damage occurred, or according to the requirements of Rule 44.

The Arbitration Committee rendered the following decision on November 5, 1931: "The contention of the Clinchfield is sustained and its bill should be paid. A defect card carries with it full authority to bill upon the party issuing the same and cannot be repudiated. Decisions 1076, 1275, 1398, 1472, 1571 and 1660 apply." —*Case No. 1684, Atlantic & Western vs. Clinchfield Railroad.*

Same Wheels Removed by One Road Within 15 Days

On August 31, 1930, a defect card was issued by the Canadian National for four cut journals under C. N. car No. 301636. On the same date the Maine Central changed two pairs of wheels at location R1-L1 and R2-L2, which were shown on the defect card as being "shelled out" and the axle as "cut." The wheels removed at location R2-L2 were the pair in dispute. A charge was made of $19.30 for new wheels applied, less scrap, and $8.39 for the axle, representing a second-hand less scrap axle. On September 2, 1930, the Maine Central again changed the wheels at location R2-L2 on account of a cut journal (Maine Central responsible) and applied second-hand wheels making no charge for the wheels or axle. On April 2, within 60 days after the second charge was passed for payment, the car owners requested that the charge for the new wheels be confined to second-hand, and claimed that it had been overcharged $12.60 according to Paragraph 8, Rule 98. The Maine Central declined to allow this claim, contending that Paragraph 8 of this rule did not apply. The Canadian National stated that it was its understanding that the object of Rule 98, Paragraph 8 was to protect the car owner where fair service was not obtained for new wheels applied. As the wheels in question were under the car only three days when they were replaced by the same road, it felt that it was entitled to credit. The Maine Central stated that the car was accepted in interchange at Vanceboro, Maine, and was properly defect carded to cover the cut journals at the locations mentioned. When the wheel change was made at R2-L2 the handling line contended the wheels were found in a shelled condition, such as to be considered scrap wheels. Billing was rendered in accordance with Rule 98, Paragraph 5. The Maine Central contended that it recognized the principle of Rule 98, Paragraph 8, and had there been no defect card involved in connection with the change of wheels and had the wheels been removed on its line with only wheel defects, it would have acceded to the car owners' request for cancellation of the betterment charge. However, on account of a defect card being involved, it was its opinion that the delivery company was responsible. It contended that as handling-line responsibilities extend to repairs on authority of its defect card, it was justified in maintaining that the initial repairs which were made on the foreign road's defect card could not be recognized as being within the intent of Rule 98, Paragraph 8.

The Arbitration Committee rendered the following decision: "In view of the first wheel exchange having both wheels condemned on account of owners' defects in connection with the defect card for a cut journal, and the wheels applied being replaced with second-hand wheels on account of a cut journal within the 15-day period, the car owner is entitled to protection under Paragraph 8, Section (b), Rule 98. The contention of the Canadian National is sustained."—*Case No. 1687, Canadian National vs. Maine Central.*

Application of K-1 Triple for Convertible Type Sustained

On November 20, 1930, Shippers Car Line Corporation car No. 8869 had the air brakes cleaned, oiled, tested and stenciled per Rule 60, and a charge of $4.40 was rendered by the Illinois Central to cover. The repair card also included a charge of $13.55 to cover Type K-1 triple valve applied and a convertible type removed, although under the "Why Made" column the Illinois Central stated that the car was stenciled K-1. In its statement the Shippers Car Line Corporation pointed out that the air brakes of car SHPX 8869 were cleaned, oiled, tested and stencilled per Rule 60 by the St. Louis-San Francisco at Tulsa, Okla., on April 9, 1930, and that that road's repair card showed plainly Type K-1 triple R and R. On November 29, 1930, the Illinois Central performed the same air brake work per Rule 60, removed the convertible type triple, and made the additional charge for the Type K-1 triple. The Car Line Corporation contended that the St. Louis-San Francisco repair card was correct and that the Illinois Central should have protected itself to the extent of joint evidence or defect card. The fact that this was not done, it contended, indicated that a K-1 triple valve was on the car when received and, therefore, the charge for conversion was in error. Not being a party to the rules, the Shippers Car Line Corporation stated its willingness to be governed by the decision of the Arbitration Committee. The Illinois Central stated that Rule 90 provides that if an intermediate road finds it necessary to standardize wrong repairs, it may render a bill against the car owner for the expense involved, except as provided under Rule 57. Triple valves are not covered in this rule. Therefore, it contended that it was not required to protect itself in interchange against the improper triple valve on the car.

The Arbitration Committee in its decision rendered November 5, 1931, said: "The contention of the Illinois Central is sustained. Rule 90 covers."—*Case No. 1688, Shippers Car Line Corporation vs. Illinois Central.*

Car-Washing Equipment

DURING the past year, The DeVilbiss Company, Toledo, Ohio, has developed two new portable outfits for washing railroad passenger cars and motor coaches. One of these is designed primarily for cleaning cars for road service while the other, of somewhat similar design though differing in accessories, is adapted principally to the washing of cars preparatory to painting.

The outfit for washing cars preparatory to painting consists of a DeVilbiss type QM-5059 30-gal. pressure feed tank mounted on wheels, a type GI-520 spray

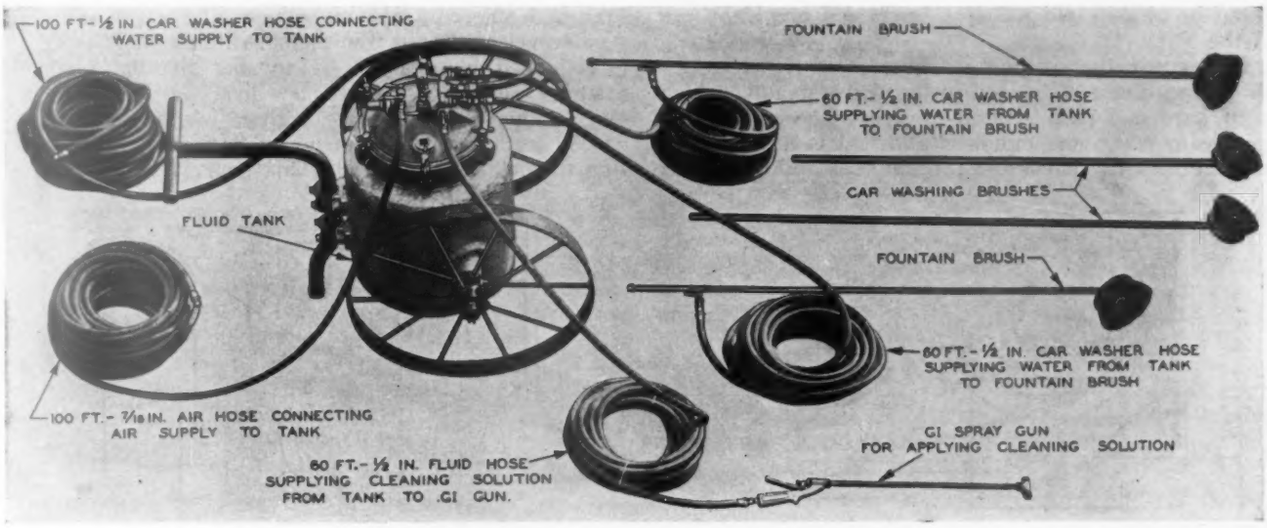
gun and a type CW-503 car-washing gun together with the necessary lengths of air, water and fluid hose and connections. This outfit includes one seven-foot and one four-foot hand car-washing brush.

The other outfit used for cleaning cars in road service is similar to the one described above, the principal difference being the inclusion of one four-foot and one seven-foot fountain type brush in addition to the hand brushes. The outfit does not include the type CW-503 car-washing gun.

When using the outfit designed for washing cars preparatory to painting, a two-man crew is used on the exterior of the car. One end of a fluid hose is attached to the tank and the other to the type GI spray gun. A 100-ft. length of air hose is connected from the air line to the regulator on the tank and the 100 ft. length of car washing hose is connected from the main water line to the tank. A pressure of from 40 to 50 lb. is used on the fluid tank. The car-washing hose is then connected to the type CW car-washing gun and to the connection on the tank. A 60-ft. length of air hose is connected to the type CW gun and to the tap on the tank. Full air-line pressure is used with the CW gun. The air and water hose are taped together at intervals of five feet, which aids materially in handling the equipment. The water valve on the CW gun is closed and the air and fluid cocks to and from carefully scrubbed and overlapping seams have all dirt and grease removed, and then are washed down.

The interior of the car is cleaned in sections of from 12 to 15 ft. Work is started at one end on the upper ceiling and ventilator. The solution is sprayed on, after which the surface is lightly rubbed with a sponge and then rinsed off with the car-washing gun. The cleaned surface is then wiped with a clean sponge, squeezed dry, to remove water drops which might leave spots in drying. The entire sides of the coach are treated in a similar manner. If the trucks are to be cleaned, a full-strength solution is sprayed on them. This is washed off after an interval, using full pressure from the car-washing gun.

The work involved in cleaning cars for road service with the other type outfit is somewhat similar. The cleaning solution is sprayed on the sign board at the top of the car with the spray gun. A section covering about one-fourth of the length of the car can usually be done at one time. In the section, all the surface extending downward from the sign board to the bottom of the car is sprayed at one time. This area, including the windows, is then thoroughly scrubbed. The long handle car-washing brush is used from the sign board to the bottom of the windows, and the short handle car-washing brush from the bottom of the windows to the bottom of the car. Cleaning around


100 FT.- ½ IN. CAR WASHER HOSE CONNECTING WATER SUPPLY TO TANK
FOUNTAIN BRUSH
60 FT.- ½ IN. CAR WASHER HOSE SUPPLYING WATER FROM TANK TO FOUNTAIN BRUSH
CAR WASHING BRUSHES
FLUID TANK
FOUNTAIN BRUSH
60 FT.- ½ IN. CAR WASHER HOSE SUPPLYING WATER FROM TANK TO FOUNTAIN BRUSH
100 FT.- ⅜ IN. AIR HOSE CONNECTING AIR SUPPLY TO TANK
GI SPRAY GUN FOR APPLYING CLEANING SOLUTION
60 FT.- ½ IN. FLUID HOSE SUPPLYING CLEANING SOLUTION FROM TANK TO GI GUN.

DeVilbiss equipment for cleaning cars for road service

the tank and guns are opened, as are the air and water valves to the type CW gun. The outfit is then ready for operation.

In washing the exterior of a car for painting, all ventilator screens, guards, windows, baggage racks and furnishings are removed. The work is started at the ventilator sides and deck. The solution is sprayed on with the GI gun held a few inches from the work. A section of from 12 ft. to 15 ft. is sprayed at a time. A man with a long handle car-washing brush follows, scrubbing the surface that has been sprayed. The portion cleaned is washed with water from the type CW gun which is held a few feet from the work and the water is flushed down the side of the car. The full length of the ventilator side and deck is cleaned in this way.

The sides of the car are then treated in a similar manner from the edge of the deck down to the weather strip at the bottom of the window. The car is then cleaned from the weather strip down. Rivet heads are the rivets is done with a circular or rotary motion. The short- and long-handle fountain type brushes are used to scrub and wash down the sides of the car and flush down all remaining traces of the cleaning solution.

While the operator using the short-handle fountain brush is finishing this operation on one section of a car, the other man, using the long-handle brush, takes the spray gun and applies the solution on the next section of the car to be cleaned.

Southern Pacific Statistically Proud of Safety Record—Justifiably pleased with its record for the safe transportation of passengers, the Southern Pacific, Pacific Lines, set its statisticians to work, with the astonishing result that they figured that a full load of passengers, traveling at an average speed of 40 miles an hour, could ride for 789 years on a Southern Pacific train without a fatality as the result of an accident. It has been more than 12 years since the life of a passenger was lost in a train accident on the railway's Pacific Lines.

In the Back Shop and Enginehouse

Portable Machine for Drilling Wheel-Hub Liners

SHOWN in the three drawings are the assembly and details of a portable machine for drilling and tapping the stud holes in hub liners and wheel hubs. This device is used by an eastern road for performing this work when the wheels are mounted on the axle.

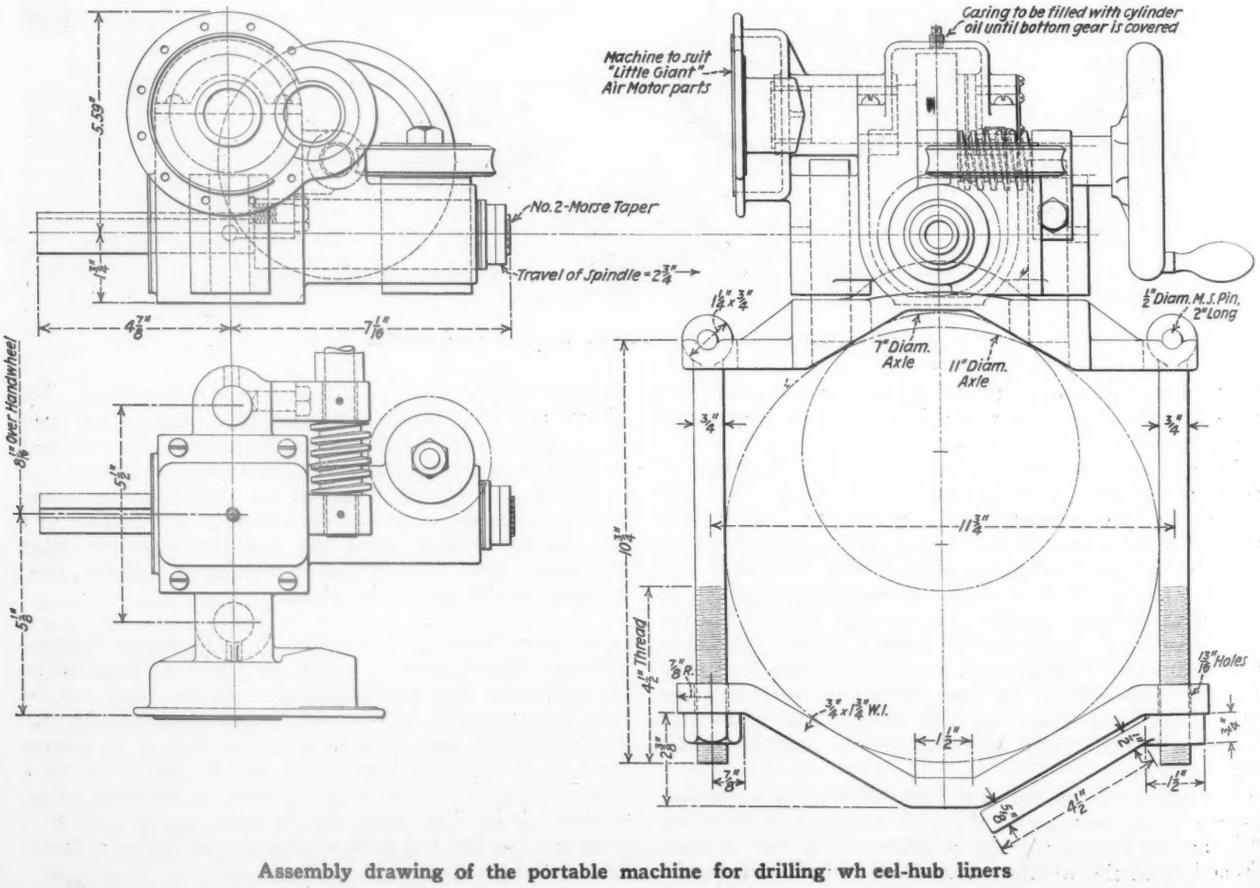
The holding clamp is designed for axles having a diameter of from 7 in. to 11 in. The top part of the clamp on which the drilling machine rests is of cast steel. It is secured to the axle by means of two ¾-in. by 10¾-in. I-bolts and ¾-in. by 1¾-in. wrought-iron bottom clamps. One of the I-bolts is secured to the bottom clamp, as shown in the assembly drawing, by a 4½-in. handle in lieu of a nut. By unscrewing the handle, the bottom clamp can be dropped clear of the axle by swinging it to the left, as shown, on the ½-in. diameter by 2-in. pin which is inserted through the eye of the bolt.

Power for the drilling machine is supplied by an air motor, direct connected to the drive spindle, which is of hardened steel ground to size. The end of the spindle to which the motor is attached is machined to suit the motor. The same procedure is followed with respect to the motor-attachment part of the body of the machine, which is of malleable iron.

The drive spindle is fitted with a helical gear having an outside diameter of 3.17 in. and a pitch diameter of 3.03 in. It is press fitted to the spindle and secured by a 3/16-in. pin and a key 1 in. long which fits in a ¼-in. by ⅛-in. keyway. It meshes with a similar helical gear at 90 deg. which is keyed to the end of the spindle shaft. Both gears are case-hardened, have 30 teeth with a helix angle of 45 deg., and are of the same size. The detail dimensions of these gears are shown in the upper left-hand corner of one of the drawings.

The helical gear on the spindle shaft is provided with a sleeve on which is fitted a thrust bearing to take the end thrust of the drill spindle. This bearing has 32 3/16-in. steel balls which are retained in hardened cast-steel races. The gear and sleeve is keyed to the spindle shaft by a 5½-in. feather key which fits into a ¼-in. by ⅛-in. keyway. The total width of the gear and sleeve is 2¾ in., which allows a maximum feed travel of 2¾ in. for the spindle.

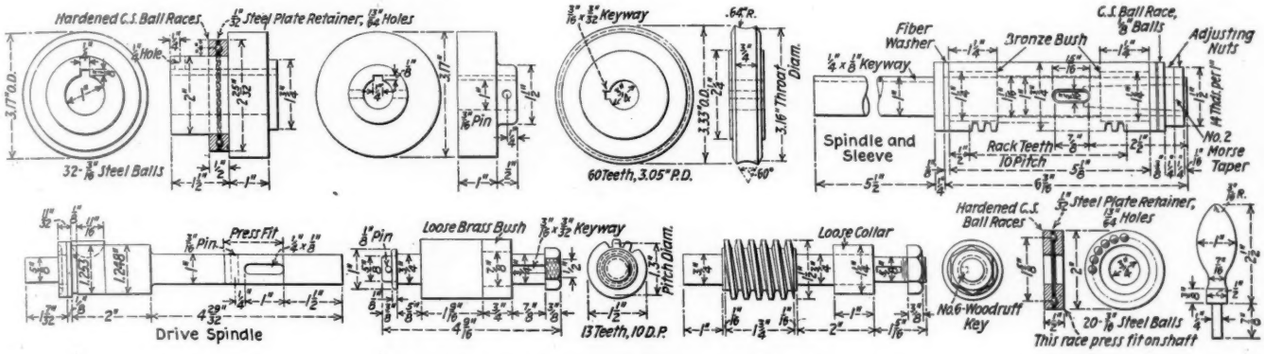
The feed is obtained by turning the hand wheel fitted to the end of a shaft on which is a worm 1¾ in. long. This worm meshes with a worm gear which has 60 teeth, a pitch diameter of 3.05 in., and an outside diameter of 3.33 in. This gear is keyed to the



Assembly drawing of the portable machine for drilling wheel-hub liners

end of a vertical shaft which carries a pinion with 13 teeth and a pitch diameter of 1.3 in.

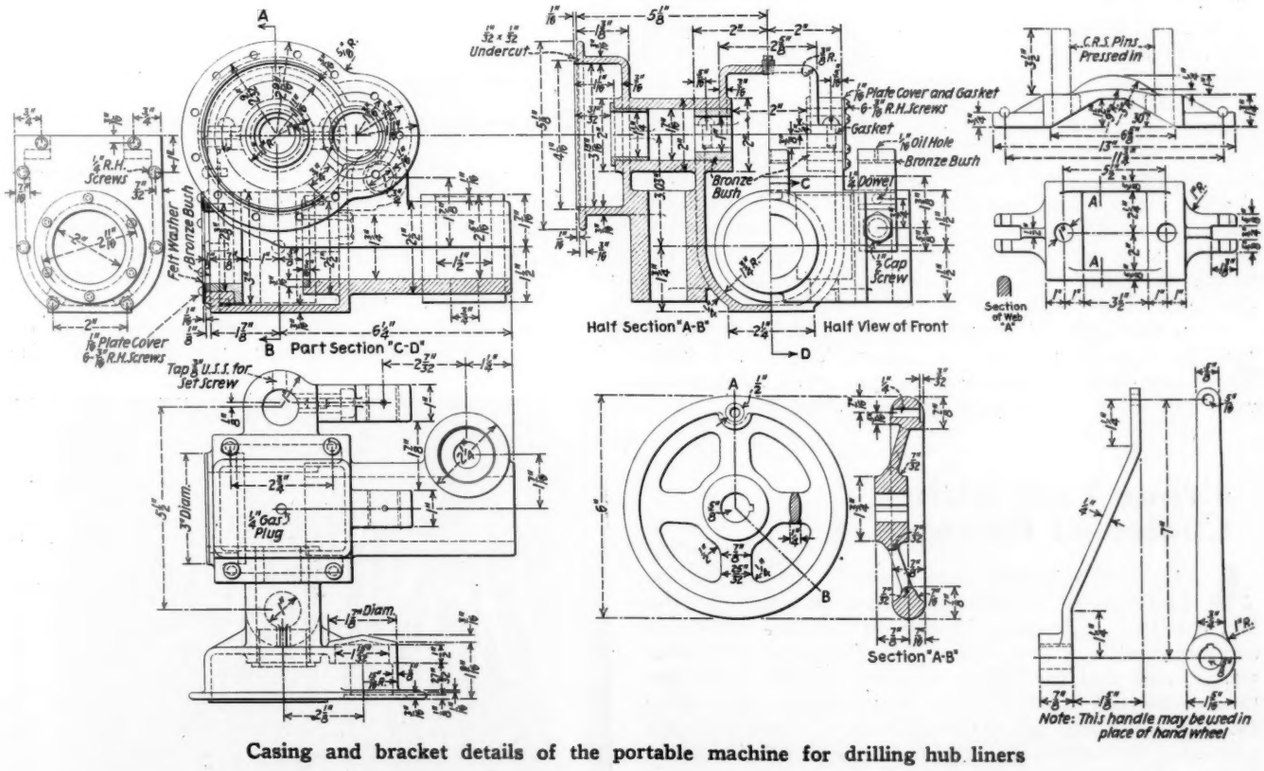
This pinion engages the teeth of a rack gear which is cut on the sleeve of the spindle. The outisde end of the sleeve is provided with a ball-thrust bearing and a fiber washer is provided at the opposite end. Thus, by turning the crank handle the drill or tap is fed into the work. The end of the spindle is machined for a No. 2 Morse taper shank. The hole for the drift key extends through both the sleeve and spindle.



Details of the handle, spindle and helical gears

The body of the machine is of malleable iron. The cover is of aluminum and is provided with a plug for oiling. All the bearings on this portable machine have bronze bushings.

This drilling machine was made in the shop tool-room. It can be easily removed from the top-clamp bracket by lifting clear the two 1-in. vertical pins, which are shown in dotted lines, on the top-clamp detail. This arrangement facilitates moving the machine and clamping device around the shop as well as clamping to the axle.



Casing and bracket details of the portable machine for drilling hub liners

Drawer on Ball Bearings For Heavy Tools

By Edwin G. Jones

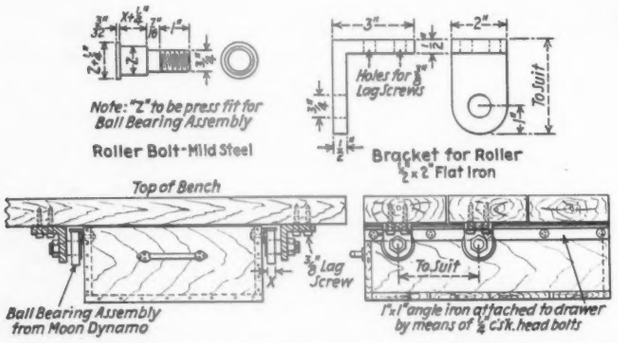
THERE are many methods of sliding bench tool drawers. The most common is to apply angle irons along the top on each side of the drawer to slide in Z-irons secured to the bench. This method of hanging a bench drawer is old. The drawer will not slide freely, even when it is well lubricated, and is difficult to open when the drawer contains a large number of heavy tools.

A workman usually opens his bench drawer at the beginning of the day's work and removes the tools which he thinks he will need and then closes the drawer. These tools, although some of them are not used during the day, help to make an untidy bench.

The type of drawer as shown in the drawing eliminates all of the above bad features. It can be opened freely with any number of tools in it and lubrication is not entirely necessary. It is best, however, to lubri-

cate the ball bearings at least once every six months.

This method of hanging a bench drawer is not expensive and requires little time. The slide guides are made of any size angle iron which may be found around a shop. However, 1-in. by 1-in. angle iron is preferred. These guides are attached to the drawer by means of ¼-in. counter-sunk or round-head bolts. They may be attached about ¾ in. from the top of the drawer. The bearing bracket is made of ½-in. by 2-in. flat iron and drilled as shown. This bracket is attached to the bench by means of two ⅜-in. lag screws. The ball bearings are old discarded ball bearings from a Moon Dynamo. Other types of ball bearings may be substituted. There are four of these to each drawer which are held to the bracket by means of a shoulder bolt. This bolt is made of mild steel and the body is


Note: "Z" to be press fit for Ball Bearing Assembly
Roller Bolt-Mild Steel
Holes for ⅜" Lag Screws
To Suit
Bracket for Roller ½ x 2" Flat Iron
Top of Bench
⅜" Lag Screw
To Suit
Ball Bearing Assembly from Moon Dynamo
1"x1" angle iron attached to drawer by means of ¼" C/Sk. head bolts

A bench drawer which slides easily when filled with tools

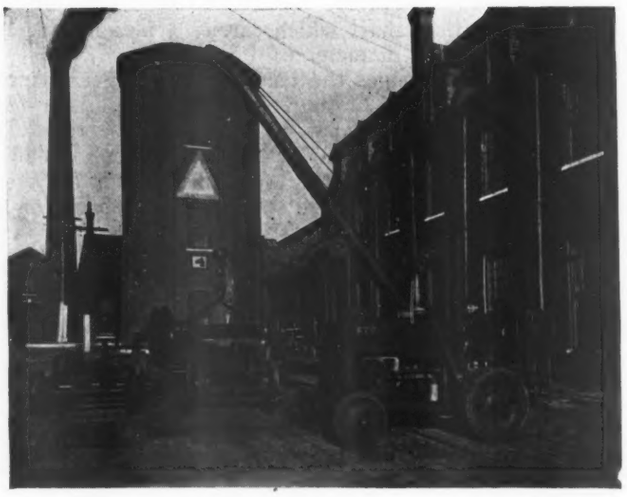
made for a light press fit for the ball-bearing assembly. A head is put on the bolt as shown and the entire bearing assembly is held in place by the ¾-in. end which is drawn tight to the bracket.

The brackets with the rollers assembled should be spaced as indicated in the drawing, "to suit," according to the length of the drawer and the distance which the drawer is desired to be opened. To prevent the drawer from being pulled out too far and away from the back set of bearings, a wood strip or some other suitable stop may be attached to the underside of the bench over the drawer. This is not shown in the drawing.

With this type of drawer the work is made easier for the repairman, especially around a railroad shop. Tools can be easily obtained and put away after using with little effort on the part of the repairman.

Crane Unit with Choice of Power

ANNOUNCEMENT was recently made that the Loadmaster crane unit, manufactured by the Bucyrus-Erie Company, South Milwaukee, Wis., is available with either Case or McCormick-Deering power, and that the lifting capacity of this crane has been increased to 4,500 lb. Both engines are four-cylinder units and can be furnished for operation with gasoline, kerosene, or distillate. The McCormick-Deering engine has 4½-in. by 5-in. cylinders and is rated at 31½ hp. at 1,000 r.p.m. The Case engine has 3⅞-in. by 5½-in. cylinders and is rated at 34½ hp. at 1,100 r.p.m. Four speeds forward are provided with the first engine which range from 2.27 to 10.41 miles an hour, while three speeds forward are available with units equipped with a Case



Loadmaster crane with lifting capacity of 4,500 lb. and hoist speed of from 38 to 75 ft. per min.

engine; from 2.77 to 10.95 m.p.h. The reverse speed with either of the two power units is 3.11 m.p.h.

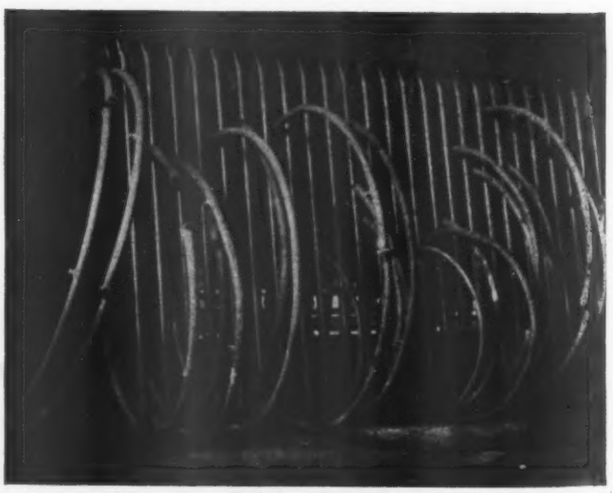
The new Loadmaster unit has a wheel base of from 71½ in. to 78 in. and a turning radius of from 11 to 15 ft.

The wheel base and turning radius vary according to the type of power unit installed. The purchaser has the choice of solid rubber tires, pneumatic tires or crawler mounting. In the case of the latter, the travel speeds forward range from .83 to 3.8 m.p.h. and the reverse speed is 1.1 m.p.h.

Rack for Storing Tire-Heating Equipment

THE rack shown in the illustration is constructed from discarded sections of superheater units. The ends of the units are flattened and secured at the top by two ⅝-in. rivets to a pressed steel hood of the desired length.

Each section of the rack represents one complete unit, the bottom being made merely by flattening out the unit and bending it in a triangular shape. The



Discarded superheater units were used to make this rack for tire heaters

bottoms of the units are then riveted to a steel bedplate.

Sufficient space must be provided between the sections to permit placing the tire heater in position, and the rack should be at floor level at the base to permit rolling the ring in position while it is hot.

The height and length of the rack depend on the number of tire heater rings in use and the diameter of the wheels which are handled in the particular shop where this work is performed.

Throttle and Stand-Pipe Grinder

GRINDING throttle-valve cases and stand pipes is a hard and tedious job when the work is done by hand. The grinder stand, of which the assembly and details are shown in the drawing, is used to eliminate a large part of the labor involved when the work is performed manually.

The machine is operated by an air motor which is fitted to a No. 3 Morse taper shank. This shank, in turn, operates a set of gears which are connected through crank arms to the three index shafts. The grinder stand is designed for three throttle pipes and three stand or dry pipes. The throttle pipes are placed on the stand directly above the latter, as shown.

Crank arms *3* are secured to the top and bottom shafts at each space. The crank connection from the train of gears at the motor transmits a reciprocating motion to the top and bottom shafts which in turn is transmitted to the crank arms *3*. These are connected to the levers *8* for the top shaft only. The connection levers *8* are pivoted to a ⅜-in. dowel which is located near the center of the index-plate arm *12*. Thus, the reciprocating motion of the shaft is transmitted to the index or grinding plate *13*. A spring is secured to the end of the index plate arm *12*, as shown in the assembly drawing, to hold the plate square against the work and to engage the top end of the vertical index *9* which can be adjusted to suit the desired height of the throttle pipe when finished.

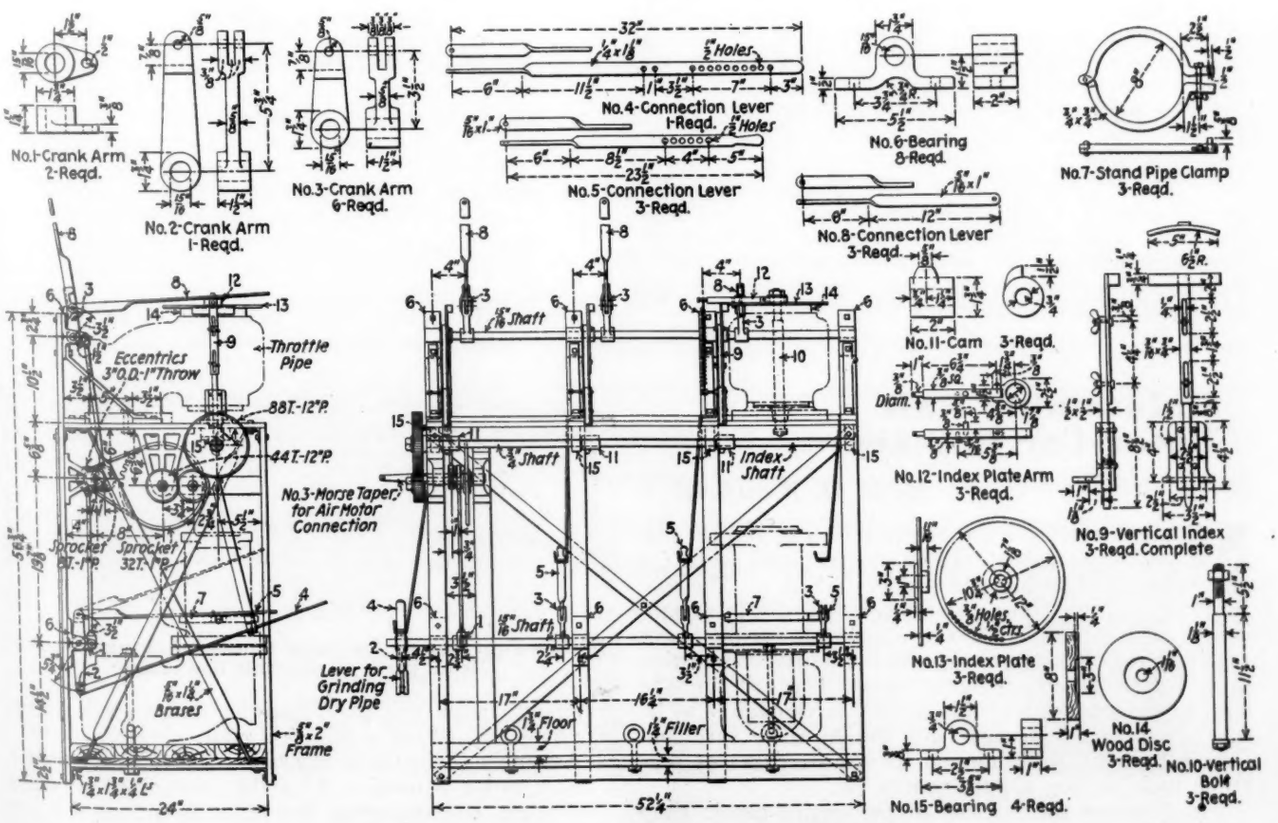
A wood disc, *14*, 8 in. in diameter, is secured to the bottom of the index plate *13* by the vertical bolt *10*. This disc keeps the plate in position without scoring the inside face. The index plate is drilled around the circumference with ⅜-in. holes spaced ½-in. center to center to facilitate the grinding operation.

The dry and stand pipes are ground together by a similar reciprocating motion which is transmitted through the bottom shaft, crank arms *3*, and connection levers *5* to the stand-pipe clamps *7*.

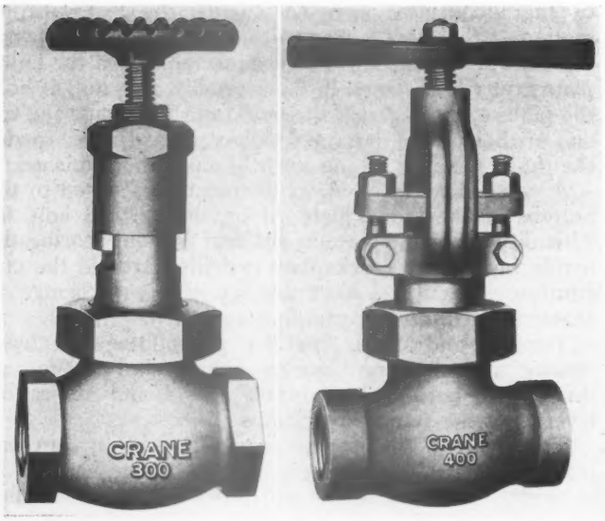
The frame of the stand is made of ⅝-in. by 2-in. bar iron. It is 4 ft. 8¾ in. high, by 4 ft. 4¼ in. long by 24 in. wide. The dry and stand pipes are bolted to the floor of the stand as shown, while the throttle pipes are set on the top bench 43½ in. above the shop floor.

Valves For High Pressures and Temperatures

THE Crane Company, 836 South Michigan avenue, Chicago, recently placed on the market two valves which have been specially designed for high pressures and temperatures. Valve No. 300 has a hard metal body, renewable Exelloy seat, plug type alloy disc and outside screw and yoke. It is designed for 300 lb. steam working pressure and a temperature not exceeding 550 deg. F. The No. 400 valve has a Monel metal



Stand for grinding throttle-valve cases and stand pipes



Left: Valve designed for 300-lb. pressures and 550-deg. F. Right: Valve for 300-lb. pressures and 750-deg. temperatures

body, outside screw and yoke, and renewable plug type seat and disc. This valve is designed for 300 lb. pressure and a total temperature not exceeding 750 deg. F.

The No. 300 valve is designed so that the threads of the valve stem are out of the path of the steam and consequently less subject to the deteriorating effects of high temperatures and wear caused by incrustations of scale. The yoke is designed to be as compact as possible without sacrificing accessibility for packing.

Monel metal is used for the body of the No. 400 valve because of the resistance of this metal to pressures, temperatures and corrosion. The ends of the body are reinforced by heavy bands and have long, accurately cut threads to insure tightness. The bonnet is also of Monel metal and is held pressure-tight to the body by a union ring of nickel alloy. The yoke is cast manganese bronze. The stuffing box is designed to eliminate the trouble which frequently occurs where a large ring with fine threads is used to hold the glands. The one-piece gland and flange of nickel alloy is held in place by two steel I-bolts. When the packing is being replaced or adjusted, these I-bolts swing out of the way. They are hinged to wings built on the yoke. The stem and seat of the No. 400 valve are also of Exelloy, a metal which has a minimum tensile strength of 100,000 lb. per sq. in.

Maintaining Rail Motor-Car Engines

By E. O. Whitfield

MAINTAINING the engines of rail motor cars requires trained personnel, accurate tools for precision workmanship and proper facilities. The majority of railroads have experienced difficulty in designing the proper tools and testing appliances for the heavy repairing of the large types of internal-combustion equipment used in rail motor cars. The rail car was born in economy, but if this natural advantage is to be retained, railroad managements should make sure that sufficient capital is authorized for the purchase of precision tools, testing appurtenances, etc.

Fig. 1 shows the interior of the engine-repair shop of the New York, New Haven & Hartford. In the foreground is shown a boring bar in position in the crank case of a Brill-Westinghouse Model No. 250 engine. The operation and use of the boring bar which is shown assembled in the crank case of the engine *A* was described in the December, 1931, issue of the *Railway Mechanical Engineer*, page 596—the boring bar is turned by means of the handle shown, which in turn rotates the cutters to finish to size the bearings mounted in the crank case.

Fig. 1—Engine-repair department of the rail-motor-car shop of the New York, New Haven & Hartford

The cam-shaft bearing reamer *B* shown in the foreground was made in the shop and enables perfect line reaming of cam-shaft bearings. This operation is performed with the cylinder heads and through bolts tightened inasmuch as a bearing which appears to be perfectly reamed out will tighten on the shaft after the through bolts are secured due to flexure in the casting. The reamer proper is a standard expansion type with Morse tapered shank. The reamer shank is bored out to fit the expansion reamer which can be purchased on the market. One end of the reamer is squared to receive the wrench which permits operation by hand. In the engine shown in the foreground Fig. 1 there are four cam-shaft bearings per shaft. Two new bearings are applied and reamed out at one operation, the two old bearings acting as a pilot. The reamer is then removed and actuated from the other end of the

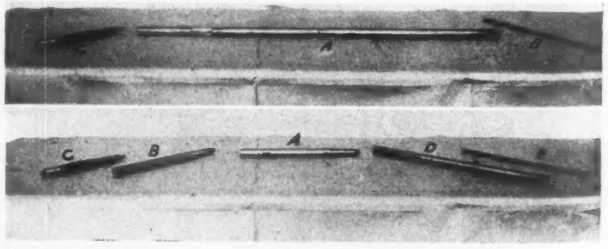


Fig. 2—Top: Reamer for lining camshaft bearings—Bottom: Detail parts of camshaft line reamer

engine to ream out the remaining two new bearings, the ones reamed out acting as a pilot.

Assembly *C* shows the operation for reseating valves. An air motor is used to drive the commercial reseating tool when counterboring for replacement seats. The

(Continued on next left-hand page)

STRENGTHEN YOUR BOLTED CONNECTIONS WITH AGATHON ENGINE BOLT STEEL

Designers know that there are forces working from one side of the locomotive to the other that tend to rack the locomotive. « They increase in violence with the locomotive's power. « The old material that once served for engine bolts is unable to restrain these greater forces. Bolts stretch, parts loosen and maintenance increases. « But Republic metallurgists have kept abreast of the new conditions and in Agathon Engine Bolt Steel have developed a material with high elastic limit, free from seams or slag pockets and possessed of great fatigue resistance. « You can safely trust Agathon Engine Bolt Steel to keep parts tight under the most difficult operating conditions.

Toncan Iron Boiler Tubes, Pipe, Plates, Culverts, Rivets, Staybolts, Tender Plates and Firebox Sheets • Sheets and Strip for special railroad purposes • Agathon Alloy Steels for Locomotive Parts • Agathon Engine Bolt Steel • Nitralloy Agathon Iron for pins and bushings • Agathon Staybolt Iron • Climax Steel Staybolts • Upson Bolts and Nuts • Track Material, Maney Guard Rail Assemblies • Enduro Stainless Steel for dining car equipment, for refrigeration cars and for firebox sheets • Agathon Nickel Forging Steel (20-27 Carbon) . . . . . .

AGATHON STEELS

CENTRAL ALLOY DIVISION

REPUBLIC STEEL CORPORATION

MASSILLON OHIO

apparatus shown permits absolute alinement of the seat with the guide. The secret of this is in the ball joint in the pilot-guide holder which becomes rigid when the clamp handle is tightened.

In front of the bench in the left background is a Sterling crank case *D* with the front end and flywheel housing in position on the boring stand. The same procedure is used to bore the main bearings on the Sterling engine as on the larger model No. 250 Brill-Westinghouse engine already described.

A small crank shaft is shown at *E* which is being checked for bearing alinement. For more detailed information on this device see the *Railway Mechanical Engineer*, February, 1932, Page 77, Fig. 3. The engine *F* is a Sterling Sea Gull engine fitted with a camshaft line reamer.

The bench *G* is provided with a surface plate for testing oilpan and surface fits, also checking cylinder heads and covers to see if they are warped. The plate is made of castiron. An overhead monorail is provided in the shop for moving the various engine parts from one operation to another. Fig. 2 shows the detail parts and assembly of the Sterling engine cam-shaft line reamer. Referring to the top view, *A* is the reamer assembled for the roughing operation, *B* is a handle bar

Fig. 3—Jig for babbitting camshaft bearings and cutter for facing rod bearings and caps

for turning the reamer, and *C* is a finishing reamer. In the bottom view *C* is an expansion commercial finishing reamer with Morse tapered shank, *B* is a standard solid commercial roughing reamer with tapered shank, *A* is a shank of cold-rolled steel bored and turned at each end to receive the reamers *B* and *C; D* is the extension which fits into *A*, and *E* is a handle bar made of cold-rolled steel which is inserted through the circular hole shown in reamer shank. The elongated hole shown receives the key for removing the reamer. This reaming tool with the shanks assembled as shown in the top view is used to line-ream the cam-shaft bearings in Sterling Sea Gull engines. The method of operation is similar to that already described in Fig. 1. for the Brill model No. 250 engine. A true shaft .002 in. smaller than the bearings can be turned by hand easily when applied. The reamer is shown in Fig. 1, *F*.

A cutter for facing rod bearings and caps, and a jig for babbitting cam-shaft bearings are illustrated in Fig. 3. The cutter *A* is used for facing rod bearings on a milling machine. A description of the jig for holding the rod on the machine, which included an illustration showing the cutter in operation, was published in the July, 1931, issue of the *Railway Mechanical Engineer*, page 381. The cutting tools, of which there are nine, are held at the correct cutting angle by means of set screws in a circular frame. The frame is mounted on a mandrel which fits the socket of the milling machine.

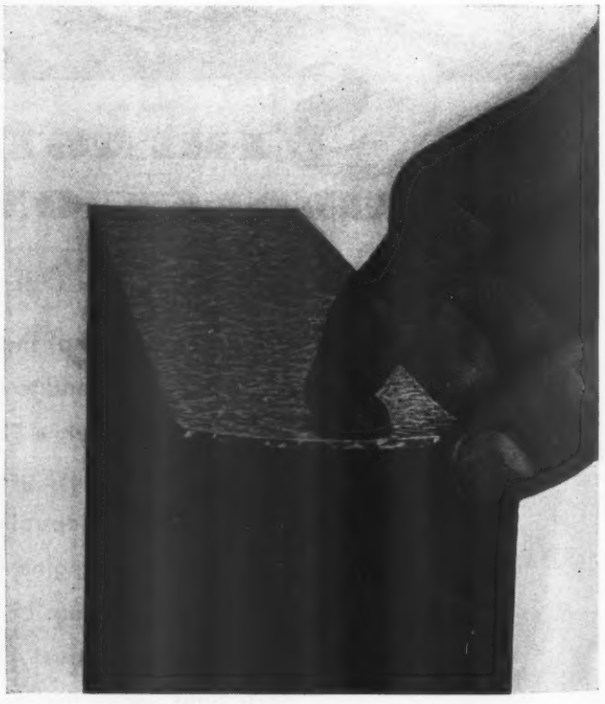
The jig *D* for babbitting cam-shaft bearings was made in the shop at the time it was decided to use babbitt instead of bronze. The parts *B* and *C* show the babbitt shells as they appear when removed from the jig after pouring. This jig is sufficiently accurate to produce babbitt bearings which can be applied without machining. These bearings with the cam-shaft reamer are shown in position in Fig. 1, *F*.

The square and clamp is made of machine steel. The circular portion is made up in two sections and the inner section is riveted to the base. The outer circular section is removable. It is bored to suit the outside diameter of the shell and overlaps to allow babbitt to form a shoulder. The squared portion provides for the shoulder on the opposite end. This method of shouldering eliminates the necessity of machining. Babbitt is poured through a hole drilled in the jig.

An Easy Way To Handle Letter Files

MANY railroad offices use letter files of the type shown in the illustration. These files when filled with correspondence and other papers become heavy and the small leather pull or jerk tabs eventually break off. Heavy files of this type with missing pull tabs are difficult to remove from a shelf, especially if the shelf is above shoulder height.

A simple, but practical scheme to handle heavy file cases of this type is had by driving a medium size rub-



A rubber-headed tack driven into the top of the case as shown makes heavy letter files easy to handle

ber-headed tack in the upper end of the wood portion of the back of the file case. The clerk, by placing the end of his finger over the head of the tack as illustrated, can readily remove the file case by tipping it out and down until it is free of the adjacent file cases.

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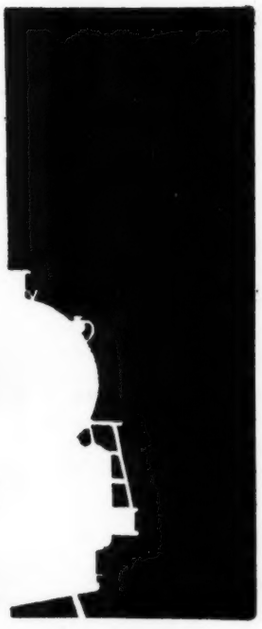


YOU CAN'T AFFORD To Wear Out OLD POWER

"Many inefficient locomotives have been retired and the number of types in use materially reduced. This meant savings in fuel and up-keep. At the same time the reduction in the number of types of locomotives resulted in time and labor savings in repair shops. To replace the discarded equipment locomotives were installed that cut fuel costs at the rate of $2,000,000 annually."

—From an annual report of a large freight carrier.

Locomotives recently built are reducing operating costs by 25% compared with locomotives five to ten years old. Can you afford to run your present equipment in view of the performance of modern locomotives?

LIMA LOCOMOTIVE WORKS INCORPORATED

LIMA LOCOMOTIVE WORKS, Incorporated LIMA, OHIO

Among the Clubs and Associations

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.—S. G. Down, president of the Railway Supply Manufacturers' Association, has announced the following appointments as chairmen of the Standing Committees of the Association: Committee on Domestic Trade—Frank P. Roesch, sales manager, Standard Stoker Company, 332 South Michigan avenue, Chicago; Committee on Foreign Trade—Walter C. Sanders, general manager, Railway Division. The Timken Roller Bearing Company, Canton, Ohio; Committee on Public Relations—H. E. Graham, assistant to president, Jones & Laughlin Steel Corporation, Pittsburgh, Pa. The members of these standing committees, whose duty will be to assist the members of the Railway Supply Manufacturers' Association in connection with commercial problems, both at home and abroad, will be selected by their chairmen. Members of the Association having domestic or foreign commercial problems that might require co-operative activity should communicate directly with the chairman of a committee or with the office of the secretary of the Association, 1841 Oliver building, Pittsburgh, Pa.

Club Papers

Chilled-Tread Car Wheels

Chicago Car Foremen's Association.—Meeting held Monday evening, May 9, at the Auditorium hotel, Chicago. Subject "Manufacture and Service of Chilled-Tread Car Wheels," presented by E. C. Edwards, traveling engineer, Griffin Wheel Company, Chicago. ¶The subject matter of Mr. Edwards' address was well covered in the formal title. Referring back to the year 1890 when the striking proposal was advanced of constructing cars of 80,000 lb. capacity, Mr. Edwards stated that chilled car wheels carried 84,000,000,000 ton-miles of revenue freight. In 1929, the year of peak business, he said that chilled-tread wheels carried more than 400,000,000,000 ton-miles of revenue freight. ¶Mr. Edwards' address was illustrated with moving pictures showing the manufacture and use, as well as the abuse, of chilled-tread car wheels. Regarding slid-flat wheels, he said: "Perhaps the greatest cause for the development of slid-flats is the failure of brakes to release at the rear of long trains when starting after a stop is made. Excellent work done by the air-brake men and closer attention to the operation of long trains have reduced the proportion of wheels removed on account of slid-flat spots from 25 to 30 per cent to about 12 per cent of the total wheels removed. This is of importance because slid-flat wheels have the lowest average life of all wheels removed." ¶"Shell-outs", cracked treads, worn-through-chill wheels, worn flanges, brake burns, comby spots and other common defects were discussed, and helpful suggestions advanced regarding means for detecting and correcting these defects. ¶In closing his address, Mr. Edwards referred to the new proposed rules of interchange which promise to be effective in helping the railroads to obtain still better service than they have in the past from chilled-tread car wheels.

One Hundred Years of Railroading in New York State

New York Railroad Club.—Meeting held May 20 at the Engineering Societies building, 29 West Thirty-Ninth street, New York. Subject, "One Hundred Years of Railroading in New York State," by Edward Hungerford, New York Central. ¶ He introduced his paper by giving an account of the first run on Aug. 9, 1831, of the DeWitt Clinton over what was then known as the Mohawk & Hudson Railroad. He graphically described the early battles between the proponents of the Erie Canal and the fight made by railroad men, led by Erastus Corning, Dean Richmond and Commodore Vanderbilt, to push the lines of what is now known as the New York Central through to Buffalo, N. Y. ¶ Mr. Hungerford sketched the development of the New York & Harlem, West Shore and other lines which were later incorporated into the New York Central & Hudson River. In his historical account he included the development of the Delaware & Hudson, the Lackawanna and the Erie, laying special stress on the factors of competition and the efforts of the various Atlantic seaboard cities, such as Boston, Mass., and New York, to secure rail routes to the west. He spoke of the efforts of Mr. Burnham of Boston to get backing for the Northern Pacific, which was one of the schemes of a number of Bostonians to secure a connecting link with the far west. Congress gave Mr. Burnham a franchise to build a railroad from the head of Lake Superior to Puget Sound, together with a gift of forty-two million acres of land. ¶ Mr. Burnham had a theory that appealed very much to Congress. He said: "This is to be a democratic railroad. There is to be no big business in this, no bankers, and no mergers, and one million are each to give one hundred dollars and each will buy one share of stock—and no more." This vision of Mr. Burnham did not materialize and the project eventually fell into the hands of the capitalists.

Mr. Hungerford closed his paper with a tribute to the men and railroads which finally resulted in the present efficient rail transportation in the Empire State.

Directory

The following list gives names of secretaries, dates of next or regular meetings and places of meeting of mechanical associations and railroad clubs:

AIR-BRAKE ASSOCIATION.—T. L. Burton, Room 5605 Grand Central Terminal building, New York.

ALLIED RAILWAY SUPPLY ASSOCIATION.—F. W. Venton, Crane Company, Chicago.

AMERICAN RAILWAY ASSOCIATION.—DIVISION V.—MECHANICAL.—V. R. Hawthorne, 59 East Van Buren street, Chicago.

DIVISION V.—EQUIPMENT PAINTING SECTION.—V. R. Hawthorne, Chicago.

DIVISION VI.—PURCHASES AND STORES.—W. J. Farrell, 30 Vesey street, New York.

DIVISION I. — SAFETY SECTION. — J. C. Caviston, 30 Vedey street, New York.

DIVISION VIII.—CAR SERVICE DIVISION.—C. A. Buch, Seventeenth and H. streets, Washington, D. C.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—G. G. Macina, 11402 Calumet avenue, Chicago.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. Thirty-ninth street, New York.

RAILROAD DIVISION.—Marion B. Richardson, associate editor, *Railway Mechanical Engineer*, 30 Church Street.

MACHINE SHOP PRACTICE DIVISION. — Carlos de Zafra, care of A. S. M. E., 29 West Thirty-ninth street, New York.

MATERIALS HANDLING DIVISION.—M. W. Potts, Alvey-Ferguson Company, 1440 Broadway, New York.

OIL AND GAS POWER DIVISION.—L. H. Morrison, associate editor, Power, 475 Tenth avenue, New York.

FUELS DIVISION.—A. D. Black, associate editor, Power, 475 Tenth avenue, New York.

AMERICAN SOCIETY FOR STEEL TREATING.—W. H. Eiseman, 7016 Euclid avenue, Cleveland, Ohio.

AMERICAN SOCIETY FOR TESTING MATERIALS.—C. L. Warwick, 1315 Spruce street, Philadelphia, Pa.

AMERICAN WELDING SOCIETY.—Miss M. M. Kelly, 29 West Thirty-ninth street, New York.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Joseph A. Andrucetti, C. & N. W., Room 411, C. & N. W. Station, Chicago, Ill.

CAR DEPARTMENT OFFICERS ASSOCIATION.—A. S. Sternberg, master car builder, Belt Railway of Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITH'S ASSOCIATION.—W. J. Mayer, Michigan Central, 2347 Clark avenue, Detroit, Mich.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. T. Winkless, Room 707, LaSalle Street Station, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—William Hall, 1061 W. Wabash street, Winona, Minn.

MASTER BOILERMAKERS' ASSOCIATION. — A. F. Stiglmeier, secretary, 29 Parkwood street, Albany, N. Y.

MASTER CAR BUILDERS' AND SUPERVISORS' ASSOCIATION.—See Car Department Officers Association.

NATIONAL SAFETY COUNCIL—STEAM RAILROAD SECTION.—W. A. Booth, Canadian National, Montreal, Que.

PACIFIC RAILWAY CLUB.—W. S. Wollner, P. O. Box 3275, San Francisco, Cal. Regular meetings, second Thursday of each month in San Francisco and Oakland, Cal., alternately.

RAILWAY BUSINESS ASSOCIATION. — Frank W. Noxon, 1124 Woodward building, Washington, D. C.

RAILWAY FIRE PROTECTION ASSOCIATION.—R. R. Hackett, Baltimore & Ohio, Baltimore, Md.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.—J. D. Conway, 1841 Oliver building, Pittsburgh, Pa. Meets with Mechanical Division and Purchases and Stores Division, American Railway Association.

SUPPLY MEN'S ASSOCIATION.—E. H. Hancock, treasurer, Louisville Varnish Company, Louisville, Ky. Meets with Equipment Painting Section, Mechanical Division American Railway Association.

TRAVELING ENGINEERS' ASSOCIATION. — W. O. Thompson, 1177 East Ninety-eight street, Cleveland, Ohio.

WESTERN RAILWAY CLUB.—J. H. Nash, 343 South Dearborn street, Chicago. Regular meetings, third Monday in each month.

NEWS

SALARIES of all New York Central employees now receiving more than $300 monthly will be reduced by five per cent. This is in addition to cuts ranging from 10 to 20 per cent which were made effective late in 1931.

Railroad Payroll Reduced $813,000,000 in Two Years

THE TOTAL railroad payroll for 1931 was $813,687,403 below that for the year 1929, and the number of employees in December, 1931, was 625,625 less than the number in the peak month of August, 1929, according to a summary of railway wage statistics for the year issued by the Interstate Commerce Commission, based on a consolidation of the twelve monthly summaries for the year.

The average number of employees for 1931, based on the twelve monthly counts, was 1,278,175, a decrease of 232,513, or 15.39 per cent, compared with the number for 1930 and a decrease of 408,594, or 24.2 per cent, as compared with 1929. The number for December, 1931, was 199,892 less than that for January, 1931, and 471,157 less than that for December, 1929.

The total compensation for 1931 was $2,127,181,287, a reduction of $463,093,556 below that for 1930. The number of hours (straight time actually worked plus overtime paid for) for the year divided by the average number of persons reported as employed at the middle of each month was 2,298 for 1931, compared with 2,511 for 1929. This comparison does not take into consideration those furloughed employees not represented among the employees in the mid-month count.

Burlington Relief Department 43 Years Old

THE RELIEF DEPARTMENT of the Chicago, Burlington & Quincy, which was organized on June 1, 1889, has issued its report for 1931. It emphasizes the importance of joint contributions in retirement insurance plans. Since June 1, 1889, the department has received $22,112,593, of which $21,162,845 represents contributions by members, $143,313 interest paid by the railroad, $733,182 income from investments, $28,604 profit from investments and $44,648 miscellaneous receipts. During the same period, the department has paid $20,745,899 in death and disability benefits, while at the present time investments amount to $1,115,785 and cash on hand to $250,908. During this period the railroad company has contributed $4,049,405 in establishing, operating and maintaining the department. In addition, it has given, without charge, the time of officers and clerks in other departments of the service used in attending to relief department business, the service of the law department, the rent, care, heating and lighting of the general offices of the department in Chicago and medical examiners' offices and the use of telegraph, transportation and other facilities.

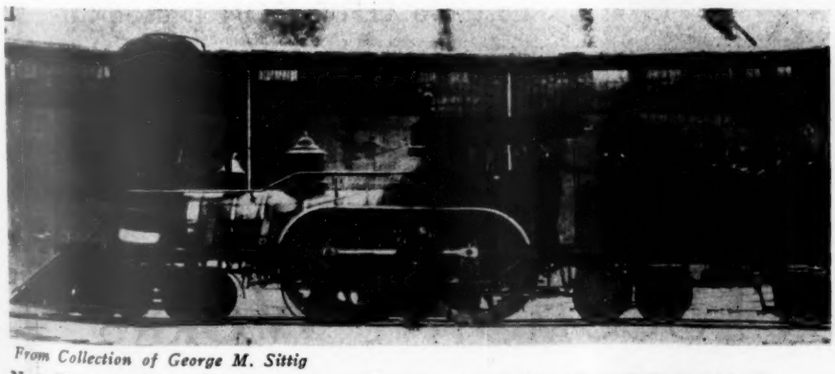
Besides the relief department plan, a pension plan has been in effect since January 1, 1922 and since that time, the pension disbursements have amounted to $6,429,486, all of which is a voluntary contribution of the company.

Favors C. N. R. Acquisition by C. P. R.

ADVOCATING the purchase of the Canadian National by the Canadian Pacific Follin H. Pickel, a prominent Conservative member from the Eastern Townships of Quebec province, speaking during the Budget debate in the House of Commons at Ottawa recently said:

"I do not understand why the people of Canada persist in trying to make themselves believe this is a solvent enterprise. It should go into the hands of a receiver and be disposed of. It is no compliment to the intelligence of the people of this country to try to bolster up that railway; if it were in my power to do so, I think it would be advisable to open up negotiations with a view to disposing of it. The only visible purchaser or receiver that I know of is the Canadian Pacific Railway Company. I have none of its stock, unfortunately; I hold no brief for that railroad, but as all Canadians are, I am proud of it. We have a bankrupt railroad and if we continue we are going to bankrupt the Canadian Pacific."

* * *



From Collection of George M. Sittig

New York & Erie 4-4-0 type locomotive No. 13 built by Swinburne, Smith & Company at Paterson, N. J., in 1849

Air-Conditioned Trains Between Chicago and St. Louis

RAILROADS operating between Chicago and St. Louis, will operate one air-conditioned train each, beginning about July 1. The cars of the Banner Blue Limited of the Wabash, including the observation-parlor car and the combination parlor-lounge-dining car will be Pullman cars equipped with the Pullman ice-type air-conditioning equipment, while the same type of air-conditioning apparatus will be installed in the chair cars and other equipment in the train by the railroad.

The Illinois Central will air-condition its Daylight Special by installing, in its own shops, Westinghouse mechanical refrigeration in 10 cars, including coaches, parlor cars, dining cars, and observation cars. The Michigan Boulevard, consisting of parlor cars, chair cars, dining cars and coaches, and the Diamond, consisting of sleeping cars, buffet cars, chair cars and coaches, will be precooled prior to departure, the railroad employing the Carrier Corporation system of precooling.

The Chicago & Alton placed air-conditioned equipment in operation on the Alton Limited on June 15, and at the same time rubberized truck parts so as to eliminate vibration and noise. Twelve cars are air-conditioned and rubberized, including chair cars, parlor cars, observation cars and dining cars, the conditioning equipment employed being that of the York Ice Machinery Corporation. The Alton is precooling all sleeping cars leaving St. Louis, Mo., Kansas City, Springfield, Ill., and Chicago. In rubberizing truck parts, rubber pads were placed at spring ends and where metal touches metal. The Chicago & Eastern Illinois is air-conditioning its La Salle. Lounge-chair cars and parlor-observation cars are being equipped with the Pullman Car & Manufacturing Corporation mechanical air-conditioning device, while the dining cars are being equipped with Pullman ice-type air-conditioning equipment.

WHO BUILT THE FIRST STEAM ENGINE?—We are indebted to A. C. Mack of the travel department of The Literary Digest for authoritative information on the question, raised in the issue of January 30, concerning the identity of the man who built the first steam engine. Mr. Mack submits a page from the latest issue of the Standard Dictionary, which credits Thomas Savery with building the first commercially successful steam engine, in 1698. However, all that had been done before was rendered obsolete when James Watt secured his first patents in 1769, in which he laid down principles still useful in the development of the steam engine.

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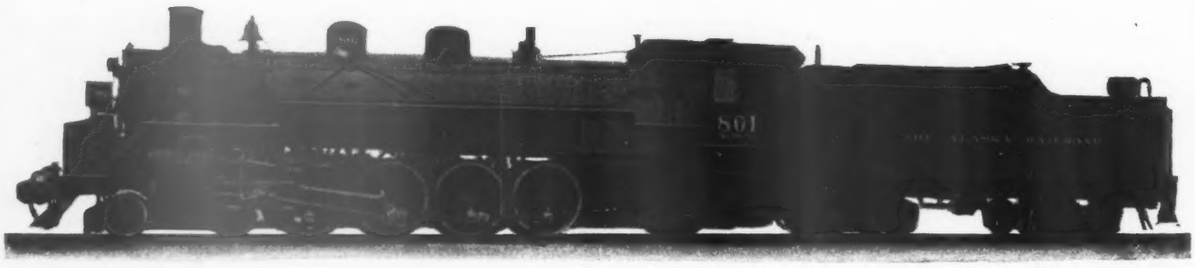
In the Far North



4-8-2 Type Locomotive for The Alaska Railroad

Cylinders	22" x 30"	Steam Pressure	220 lb.	Superheating Surface	706 Sq. Ft.	Tractive Force—	
Drivers, Diameter	63"	Grate Area	62.5 Sq. Ft.	Weight on Drivers	190,000 lb.	Main Cylinders	43,100 lb.
Boiler, Diameter	72"	Water Heating Surface	2991 Sq. Ft.	Weight, Total Engine	272,000 lb.	With Booster	54,900 lb.

A Bit of Alaska R. R. Scenery

The Alaska Railroad, owned and operated by the United States Government, is placing in service a new Baldwin locomotive of the 4-8-2 type. This engine is designed for operation on grades up to 2.2 per cent, and curves as sharp as 16 degrees. Service conditions are severe, especially in winter, when intense cold is encountered. Maximum reliability is required of every detail, and therefore ELFUR IRON is used for the cylinder and valve chamber bushings.

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA

Filling the Ladle

with

CRAMP BRASS & IRON FOUNDRIES CO.
ELFUR
PASCHALL STATION, PHILADELPHIA, PA.

ELECTRIC FURNACE IRON

Uniform consistency, from high-grade mixture and uniformly controlled temperature.

This iron will be poured into molds and cast into Locomotive Wearing Parts.

FOUNDRIES DIVISION

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA

Supply Trade Notes

THEODORE W. ROBINSON, vice-president of the Illinois Steel Company, Chicago, retired on June 6 under the rules of the United States Steel Corporation, which provide for retirement on a pension at the age of 70. Mr. Robinson will remain with the Steel Corporation in an advisory capacity.

KARL E. KEILING, sales manager of the New York Air Brake Company, has been appointed assistant to the president in charge of sales and service, with headquarters as formerly at New York. Mr. Keiling served in the purchasing department of the New York Central from 1900 until he became purchasing agent of the New York Air Brake Company in January, 1926. In October, 1929, Mr. Keiling was appointed sales manager.

JOHN H. DODGE, president of the Lowell Wrench Company, Worcester, Mass., has purchased the Safety Wrench & Appliance Company, Worcester, manufacturers of the Swaco safety hopper car wrench and the Swaco car mover. These products will be manufactured in future by the Lowell Wrench Company.

AMBROSE N. DIEHL, a vice-president of the United States Steel Corporation, succeeds A. T. DeForest as president of the Columbia Steel Company, San Francisco, Cal., a subsidiary of the United States Steel Corporation. Mr. DeForest has retired.

THE CHICAGO MALLEABLE CASTINGS COMPANY, Chicago, has purchased all of the equipment and the right to manufacture and sell the McCord journal box and lid, from the McCord Manufacturing Company, Chicago.

THE AMERICAN STEEL & WIRE COMPANY, a subsidiary of the United States Steel Corporation has opened a new warehouse at 2364 South Ashland avenue, Chicago, to supplant its former local warehouse at 403 West Lake street.

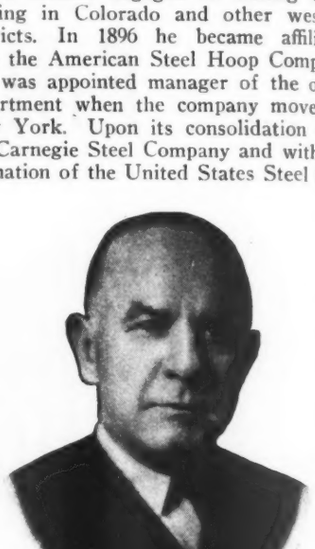
J. E. O'BRIEN, vice-president and general manager of the railroad department, with headquarters at Chicago, of the Bird-Archer Company, New York, has resigned; S. P. Foster, who has been connected with the company for the past ten years, as chemical assistant to the president has been appointed to manage the railroad department in the Northwestern territory.

J. H. FITCH, JR., who has been appointed district sales manager of a new office opened by the Inland Steel Company in the Fisher building, Detroit, Mich., began work in the steel business selling tin plate for the Liberty Steel Company in 1918. When the latter company was sold to the Trumbull Steel Company, Mr. Fitch helped organize the Newton Steel Company, Newton Falls, Ohio, and served as treasurer, vice-president and a director of this company until his resignation to go with the Inland Steel Company.

CLEMENT V. MCKAIG, vice-president of the Great Lakes Steel Corporation and previously in the service of the Carnegie Steel Company, has returned to the Carnegie Company as vice-president and general manager of sales, with headquarters at Pittsburgh, Pa., succeeding Charles L. Wood, who has resigned to go to the United States Steel Corporation. Mr. McKaig was born at Pittsburgh and was educated in the public schools, later completing classical and scientific courses at Princeton University. Mr. McKaig entered the steel business with the old Park Works of the Crucible Steel Company, Pittsburgh, working through a number of departments to the superintendency of the bar mills. In 1908 he joined the Carnegie Steel Company and on April 1, 1929, succeeded the late I. W. Jenks as general manager of bar and hoop production, including design, engineering and marketing of all special bar mill products. When the Great Lakes Steel Corporation, Detroit, Mich., began operations later in 1929, Mr. McKaig became its vice-president in charge of sales, which position he now leaves to return to the Carnegie Steel Company.

Clement V. McKaig

CHARLES L. WOOD, vice-president and general manager of sales of the Carnegie Steel Company, Pittsburgh, Pa., has been appointed vice-president in charge of sales of the United States Steel Corporation, with headquarters at New York, succeeding E. P. Thomas, who has been transferred to special duties. Mr. Wood was born on September 11, 1873, at Youngstown, Ohio. He attended the public schools of that city and then entered the Ohio State University at Columbus, pursuing a course in mining engineering with the class of 1896. He entered the industrial field as a chemist with the Calumet Furnace Company, Chicago, and when this company suspended operations Mr. Wood became engaged in mining engineering in Colorado and other western districts. In 1896 he became affiliated with the American Steel Hoop Company, and was appointed manager of the order department when the company moved to New York. Upon its consolidation with the Carnegie Steel Company and with the formation of the United States Steel Corporation, Mr. Wood was transferred to the sales department of the Carnegie Steel Company. He has served successively with the latter as assistant general manager of sales in charge of bar, hoop and band production, general sales manager and vice-president. He has held the latter position since June, 1930.



Charles L. Wood

A. CLARK MOORE, who has been elected president of the Chicago Railway Equipment Company, Chicago, to succeed E. B. Leigh, deceased, was born at Washington, D. C., on January 18, 1880, and graduated from the New York Law School in 1906. He began his career in 1899 with the Safety Car Heating & Lighting Company, remaining with that company until 1906, when he entered the employ of the Western Steel Car & Foundry Company, and later McCord & Co. In 1907 he returned to the Safety Car Heating & Lighting Company, and in 1911 was appointed general manager. He held the latter position

A. Clark Moore

until 1913, when he was elected vice-president. In 1918 Mr. Moore was commissioned a major in the air service, with headquarters at New York, having charge of the production of aircraft in the eastern territory. At the close of the war he returned to the Safety Car Heating & Lighting Company, as vice-president, which position he held until 1919, when he was appointed assistant to the president of the Globe Seamless Tube Company. He resigned from this position in August, 1921, to become vice-president of the Chicago Railway Equipment Company. He was elected executive vice-president in June, 1931.

Obituary

FREDERICK S. OVERTON, secretary and a director of the Ingersoll-Rand Company, New York, died on June 4. Mr. Overton had been in the service of the company for the past 30 years.

ROBERT M. KEENEY, president of the Pittsburgh Crucible Steel Company and vice-president of the Crucible Steel Company of America, died on June 5, in the Alleghany General Hospital, Pittsburgh, Pa., after an illness of two weeks. He was 48 years old.

R. C. VILAS, who has been associated with the Pyle-National Company, Chicago, since its incorporation in January, 1899, and who was president from 1908 to January, 1931, died suddenly at Glenview, Ill., on June 9. Mr. Vilas was chairman of the board from January, 1931, to March 14, 1931, when he resigned because of poor health.

ELBERT B. WILSON, vice-president and general manager of the Gold Car Heating & Lighting Company, Brooklyn, N. Y., died at the Presbyterian Hospital, Newark, N. J., on May 31, after a slight operation. Mr. Wilson was 62 years old. He was born at Dover, N. J., and received his early training in the Delaware, Lackawanna & Western shops in that city. Mr. Wilson had been in the service of the Gold Car Heating & Lighting Company for about 35 years, and for a long time was a member of the New York Railroad Club.

JAMES A. BURDEN, president of the Burden Iron Company, Troy, N. Y., died suddenly on June 1, at his home at Syosset, N. Y. Mr. Burden was born on January 16, 1871, in New York. He was

James A. Burden

graduated from Harvard University in 1893, and for a year studied law at Harvard Law School. In 1894 he was elected a director of the Burden Iron Company, and in 1906 he succeeded his father as president of the same company. During the World War he was a member of the co-operative committee on steel and steel products, advisory commission, Council of National Defense. Mr. Burden was formerly chairman of the board of the Hudson Valley Coke & Products Corporation and, at the time of his death, a director of the City National Bank of Troy. He was a member of a number of technical organizations and clubs, including the Iron & Steel Institute.

CHARLES J. MCPHERSON, sales manager, automotive car division, of The J. G. Brill Company, Philadelphia, Pa., died suddenly from a heart attack in Chicago on June 18. Mr. McPherson was born on July 5, 1886, at Hopkinsville, Ky. He completed his education in the University of Kentucky, from which he was graduated in 1906, later receiving his M. E. degree from the same institution. He was first associated with the Baldwin Locomotive Works and then the American Car & Foundry Company before joining the Brill engineering staff on March 4, 1913. In the early days of the World War Mr. McPherson spent considerable time in Russia representing the Brill Company's interests. After serving for a number of years as assistant superintendent, he entered the sales department in September, 1920, and was in charge of sales of the automotive car division, handling rail motor cars for steam railroads, from October, 1923, until his death. Mr. McPherson was a member of a number of clubs and associations including the American Railway Car Institute, the American Society of Mechanical Engineers, the Society of Automotive Engineers, and the Railroad Club of New York.

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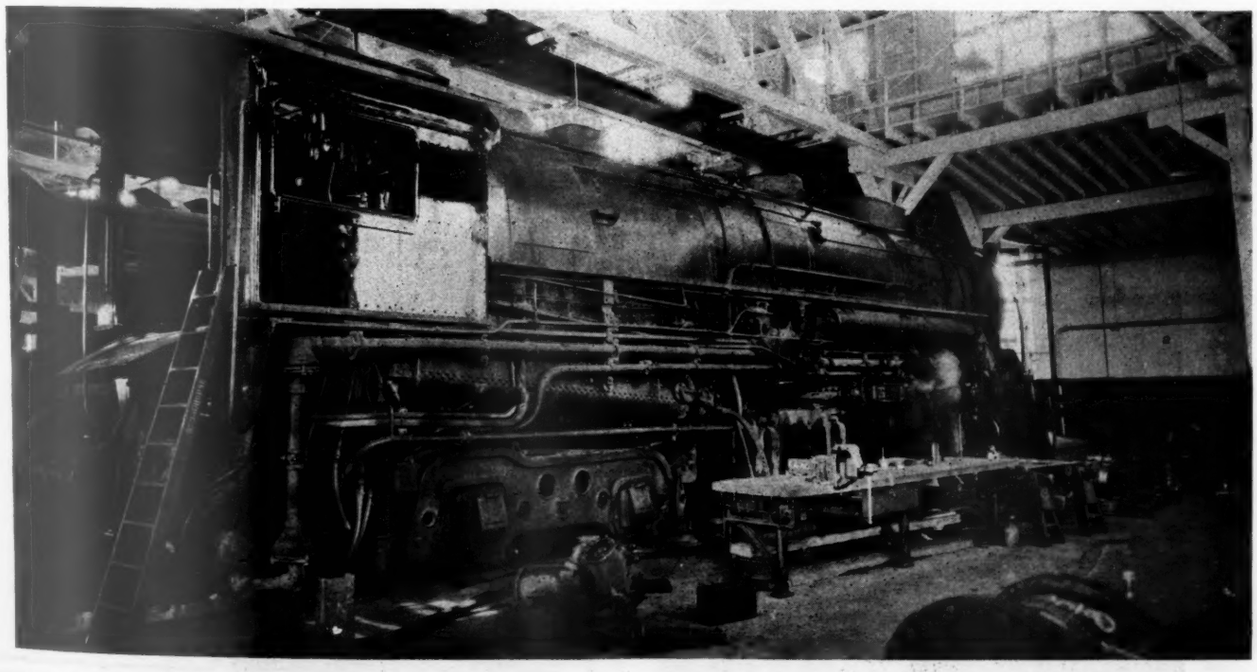
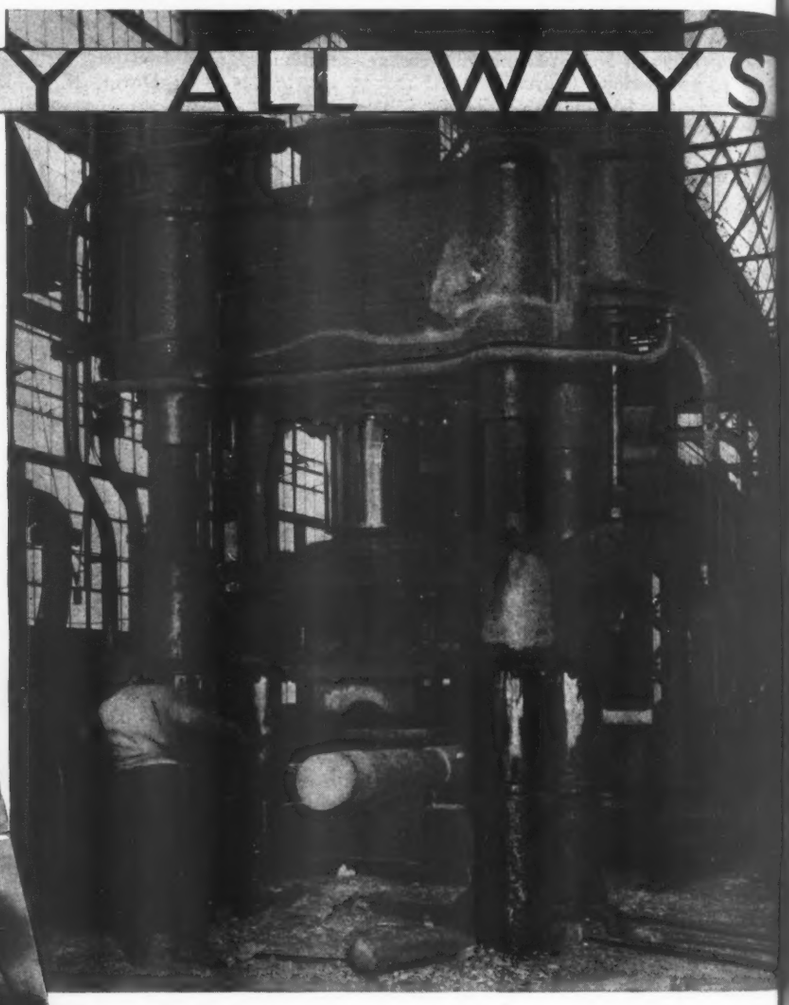


A 2-8-4 type freight locomotive undergoing heavy repairs in the Hamilton, Ont., shops of the Toronto, Hamilton & Buffalo

QUALITY ALL WAYS



Forgings of great strength, uniformity and toughness perform longest in hard service for the fewest maintenance dollars. For such low cost, dependable service specify—ALCO Forgings.

QUALITY ALWAYS

ALCO FORGINGS

Add Dependability to the Business End of the Locomotive

WITH piston thrusts on modern locomotives ranging around 175,000 lb., the responsibility of transmitting this tremendous power rests entirely upon the structural stamina of the piston rods, guides, side rods, crank pins and axles. They must not fail. In fact, it is their dependable performance that has made possible the modern locomotive with its big drawbar pull at high freight and passenger speeds.

Only quality forgings, with that extra measure of dependability can stand up under the terrific stresses of hard service. ALCO Forgings are just that kind—quality all ways—quality always. Back of every ALCO Forging stands years of forging experience, metallurgical research and scientific manufacturing methods. As locomotive builders there is that spirit of responsibility—that constant urge to produce superior forgings which enhance the dependability and efficiency of the assembled locomotive.

ALCO standards are high—always have been—always will be. Only the finest raw materials are used in ALCO Forgings. All billets are tested for chemical properties and physical soundness. They are properly pre-heated before forging and later heat-treated to insure the best in grain refinement and the highest ductility with the desired tensile strength.

To entrust ALCO with the manufacture of all your locomotive forgings is to guarantee dependability to the business end of your locomotives and big economies for your railroad.

American Locomotive Company
30 Church Street New York N.Y.

Personal Mention

General

W. Y. CHERRY has been appointed superintendent of motive power, New York zone, of the Pennsylvania and Long Island. The position of general superintendent of motive power has been abolished.

C. A. GILL, formerly superintendent of motive power, Eastern lines, of the Baltimore & Ohio, has been appointed assistant to chief motive power and equipment, same road, following his return from a year's leave of absence during which he served as chief consulting engineer of the government-operated railroad system of the Union of Socialistic Soviet Republics.

Car Department

E. M. WILCOX, master car builder of the Indiana Harbor Belt and the Chicago River & Indiana, with headquarters at Gibson, Ind., has also been appointed to the same position on the Chicago Terminal district of the Michigan Central. All three roads are units of the New York Central Lines.

Shop and Enginehouse

P. G. LEONARD has been appointed general road foreman of the Texas & New Orleans, with headquarters at Houston, Tex.

Purchases and Stores

A. G. SWANSON, storekeeper of the Chicago, Burlington & Quincy at West Burlington, Iowa, has been transferred to the St. Joseph division, with headquarters at St. Joseph, Mo.

E. J. CLARK, storekeeper of the Chicago, Burlington & Quincy at Creston, Iowa, has been appointed assistant storekeeper of the McCook division, with headquarters at McCook, Neb.

Obituary

HENRY CLAY GILLESPIE, master mechanic of the Huntington division of the Chesapeake & Ohio, died, after a brief illness of pneumonia induced by injuries received in an automobile accident at Huntington, W. Va., on May 23. Mr. Gillespie was born in Huntington on August 15, 1875, and received his education in schools there. He entered the employ of the C. & O. on March 1, 1891, and after serving his apprenticeship, was transferred in 1902 to Russell, Ky., as enginehouse foreman. In 1906 he was appointed machine shop foreman at Covington, Ky., and in 1911, general foreman at Russell. In 1912 he became master mechanic of the Chesapeake & Ohio of Indiana, and in 1920 was transferred to the position of master mechanic at Huntington.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers. State the name and number of the bulletin or catalog desired, when mentioned in the description.

BEAVER PIPE TOOLS.—An improved line of Beaver pipe tools is shown in a folder issued by The Borden Company, Warren, Ohio.

DIE HEADS.—Two new bulletins, descriptive of the K line of rotary self-opening and stationary self-opening die heads, respectively, have been issued by the Geometric Tool Company, New Haven, Conn.

FLEXIBLE COUPLINGS.—Complete details concerning the three types of Clark flexible couplings—"Triplex" for heavy duty, "Simplex" for medium duty, and "Marine" for all marine service—are given in the four-page leaflet issued by the Clark Coupling Company, 149 Church street, New York.

NORBLO AIR FILTERS.—Norblo continuous operating air filters, designed to operate successfully under varying conditions of moisture and of temperature up to 400 deg. F., are described and illustrated in Bulletin No. 500-1 issued by the Northern Blower Company, West Sixty-Fifth Street, Cleveland, Ohio.

RAIL STEEL PRODUCTS.—A wide variety of structural shapes and sizes and tubing are presented in the 43-page illustrated catalog of rail steel products issued by the Republic Steel Corporation, Cleveland, Ohio. The catalog is divided into three parts: Part I, Structural Shapes; Part II, Fence Posts and Assemblies, and Part III, Structural Tubing.

JOINTITE CORK PRODUCTS.—The catalog of 20 pages recently issued by L. Mundet & Son, Inc., 46 Eighth avenue, New York, is a compendium of information on the uses of cork for insulation purposes, including useful data, specifications, tables and charts for refrigeration, soundproofing, heat prevention, heat conservation, vibration deadening and condensation prevention. The title of the catalog is "Jointite Cork Products."

SPIRAL WELDED PIPE.—The American Rolling Mill Company, Middletown, Ohio, has published an attractive handbook on Armco spiral welded pipe, in which the spiral welding process is described and in which various tables of sizes, weights, pressures, etc., are given. The book is intended for users of specially designed pipe requiring a range of diameters from 6 to 24 in. and a variety of wall thicknesses.

BARBER CAR CEMENT.—The manufacture and use of Barber car cement, a plastic, cold-working, "asbestos-reinforced" asphalt cement, is described in an interesting 11-page booklet, which is being distributed by the Barber Asphalt Company, Philadelphia, Pa. An extensive discussion of the fundamentals of asphalt as a cementing, water-proofing and preservative agent is afforded in the booklet which describes the use of Barber car cement for the protection of steel underframes and other metal parts of railway freight and passenger cars, subject to severe service and mechanical abrasion. Two interesting illustrations in the booklet show the digging of asphalt by natives from asphalt lakes at Trinidad, B. W. I., and at Bermudez, Ven. Another illustration shows an open Gilsonite vein at Rainbow, Utah, operated by the Barber Asphalt Company, which is said to be the largest miner, refiner and distributor of native asphalts in the world.

TESTING MACHINES.—The Baldwin-Southwark Corporation, Philadelphia, Pa., has issued Bulletin No. 28 in which it has endeavored to present a short text-book about hydraulic testing machines. The bulletin opens with a brief history of hydraulic testing machines up to the development, about 1925, of the combination hydraulic cylinders for load-producing purposes, hydraulic capsules and elastic tube indicating instruments for measuring the load. The following pages deal with the new Southwark-Emery stress-strain recorder; factors of sensitivity, accuracy and reliability; control and utilization of the machine and its gripping mechanism, and the various sizes of machines offered by the Baldwin-Southwark Corporation. Views and some descriptive matter are also given concerning the four-million pound testing machine recently shipped to the University of California and the four-million pound, compression only, machine of the United States Bureau of Reclamation at Denver, Colo.

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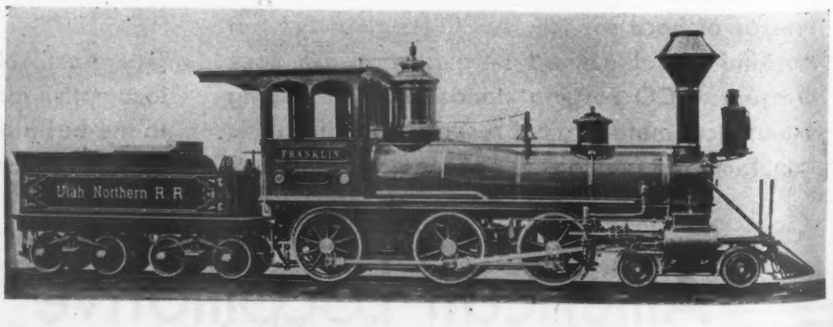

From Collection of George M. Sittig

Utah Northern 4-6-0 type locomotive built by the Grant Locomotive Works